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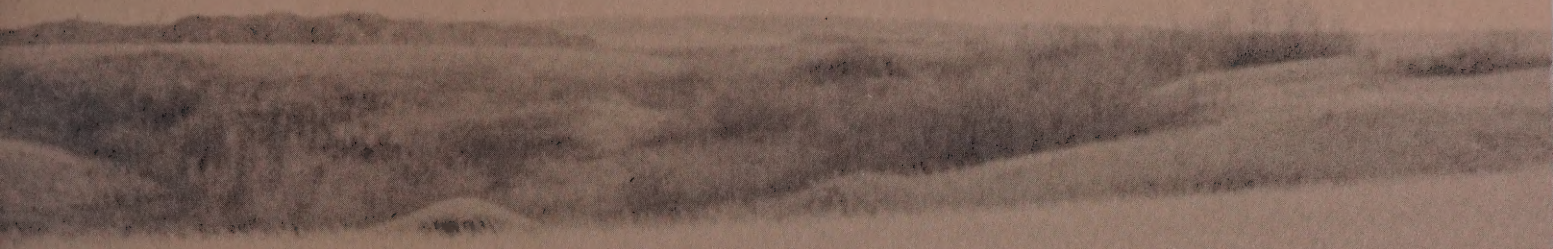

FORT UNION COAL

REDWATER II TRACT

SEPTEMBER 1981

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1981a

FORT UNION COAL REGION

REDWATER II TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

PRELIMINARY FACILITY EVALUATION REPORT

MCCONE and DAWSON COUNTIES, MONTANA

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September 1981

Michael J. Penfold

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State Director

PREFACE

This document contains a site-specific analysis and a preliminary facility evaluation report. The site-specific analysis discusses the consequences of leasing and mining a particular tract. The preliminary facility evaluation report discusses significant issues associated with an end use coal conversion facility.

There were 24 tracts identified through a screening process under the over-all direction of the Fort Union Region Coal Team. The team consists of federal, state, and local officials. The tracts are being evaluated for potential federal coal leasing for a coal lease sale scheduled for June 1983. The evaluation, called a site-specific analysis, has been completed for each of the 24 tracts.

Historically, development of a new coal mine in the Fort Union Coal Region has been associated with a coal conversion facility power plant in the vicinity of the mine. For this reason, the Regional Coal Team directed BLM to evaluate impacts of a typical facility near each potential mine. A preliminary facility evaluation report was prepared for each facility.

The Fort Union Regional Coal Team will begin ranking and grouping selected tracts into alternative leasing patterns for the 1983 lease sale using information from these individual reports. These groupings of tracts will form the basis for alternatives and a regional environmental impact statement to be developed during 1982. The analysis in this report represents an important step in a lengthy process which takes place prior to any final decision on federal coal leasing within the region.

Of the 24 tracts currently being evaluated, 16 would require the opening of new mines. One of the 16 would be specifically earmarked for small business. The remaining eight tracts constitute coal which would be needed to maintain production or prevent the by-pass of federal coal at an ongoing mining operation.

Approximately 1.6 billion tons of recoverable federal coal lie within the areas being evaluated. Final designation of some areas as unsuitable for mining under the 1977 Surface Mining Control and Reclamation Act will likely reduce the amount of federal coal actually available for leasing and development, and could remove several of the 24 tracts from further consideration. This information will not be available until early 1982.

A major purpose of the site-specific analysis and preliminary facility evaluation reports is to acquaint the public with key issues and consequences of leasing and development of federal coal reserves so that they may (1) offer comments to the Fort Union Regional Coal Team on what areas they consider most important to be evaluated and analyzed in the ranking of the tracts and in the Regional EIS and (2) offer specific advice on what decision alternatives the Coal Team should look at more closely.

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SITE SPECIFIC ANALYSIS

SITE SPECIFIC ANALYSIS

INTRODUCTION

The purpose of this action is to offer strippable federal coal reserves that can be further considered for coal leasing and development to help meet the energy needs of the Nation.

This site specific environmental analysis has been prepared for the Redwater II tract (see Map 1) in accordance with federal regulations (43 CFR 3420). It will be used by the Fort Union Regional Coal Team to further consider competitive leasing of federal coal within the tract for a June 30, 1983, coal lease sale schedule. If selected and leased, the Redwater II tract will contribute 111.2 million tons of federal coal to the regional leasing target. Presently, a regional leasing target has not been established by the Secretary of the Interior. The preliminary regional leasing target will be established in August 1981 and finalized in October 1981.

BACKGROUND

In September of 1979, the Miles City District BLM Office completed the Redwater Management Framework Plan (MFP) for Dawson, McCone, Richland and Wibaux counties. The land use planning process included applying unsuitability criteria, as much as possible, multiple-use conflict evaluation, and surface owner consultations. As a result of that work, areas were identified that could be further considered for coal development. The areas are available for consideration for new competitive leasing, leasing by exchanging and modifying existing leases (see Map 1).

Following land use planning, the BLM requested expression of leasing interest which, along with other information, guided the USGS in delineating this tract. Results of that work are summarized in this profile.

Personnel from BLM's Miles City District inventoried the tract to determine the site specific resource values and then analyzed potential environmental effects of coal development on this individual tract. Among other items, the unsuitability criteria (43 CFR 3461) were reconsidered on this site-specific basis. Any new findings of unsuitability are reflected in this report.

To be further considered for new competitive leasing, the tract will be presented to the Regional Coal Team who will rank and select tracts for a proposed lease sale schedule. The proposed lease sale tracts are then analyzed in a regional environmental impact statement (EIS). The EIS will analyze the site-specific and regional cumulative effects of coal leasing and development. Alternatives addressed in the EIS will include different combinations of tracts that meet a regional coal leasing target. The analysis of those groups of tracts could result in different impacts than the assessment made in this document for this specific tract. During the process this preliminary tract could be modified. Ultimately, the Secretary will select specific tracts for lease sale. If the tract is leased, the lessee will be required to submit a plan for mining and reclamation to the Secretary of the Interior, Office of Surface Mining (OSM) for review and approval within three years after leasing. Once a mining plan has been submitted, OSM will review the proposed developments of the mining plan. OSM will prepare a site-specific environmental assessment or EIS prior to approval of the mining plan.

Development of the tract is in accordance with the federal coal management program adopted by the Secretary of the Interior in June 1979. Basis of the program was, in part, the Final Environmental Statement for the Federal Coal Management Program. Implementation procedures are contained in Title 43—Code of Federal Regulations—Part 3400 (43 CFR 3400). Authorizing actions are the Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976; as amended; and federal regulations concerning federal coal leasing and development including 43 CFR 3400; 30 CFR 211; and 30 CFR 700-899.

TRACT DELINEATION REPORT SUMMARY

The Redwater II tract is located in the Great Plains physiographic province and lies approximately nine miles northeast of Circle in eastern McCone and western Dawson County, Montana. The tract contains one economical recoverable seam (the "S" bed) of lignite coal.

The seam is 10.5 feet in thickness, with overburden ranging from less than 150 feet to 200 feet in depth. There are no known geological hazards to surface mining in the Redwater II tract.

The generic mining plan calls for a surface mine using draglines, electric shovels, bottom-dump coal haulers, scrapers and other support equipment. A possible mining sequence for analysis purposes is shown on Map 2. The coal would thus be mined to a depth of 200 feet or until the limiting stripping ratio (20:1) has been reached. The plan indicates the most probable use of the coal would be an on-site electrical generation plant.

PRELIMINARY TRACTS

Redwater and Golden Valley

KRCRA Areas

1 Circle

2 Burns Creek-Thirteen Mile Creek

3 Southwest Glendive

4 Wibaux-Beach

Tract Delineation Areas

(1) Circle I

(2) Circle II

(3) Circle III

(4) Redwater I

(5) Redwater II

(6) Southwest Glendive

(7) Bloomfield

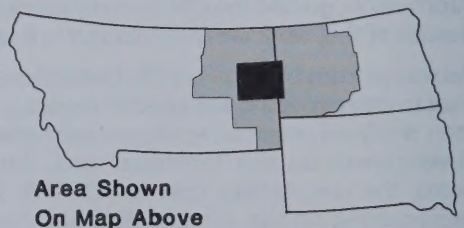
(8) Central Bloomfield

(9) Burns Creek

(10) North Wibaux-Beach

(11) South Wibaux-Beach

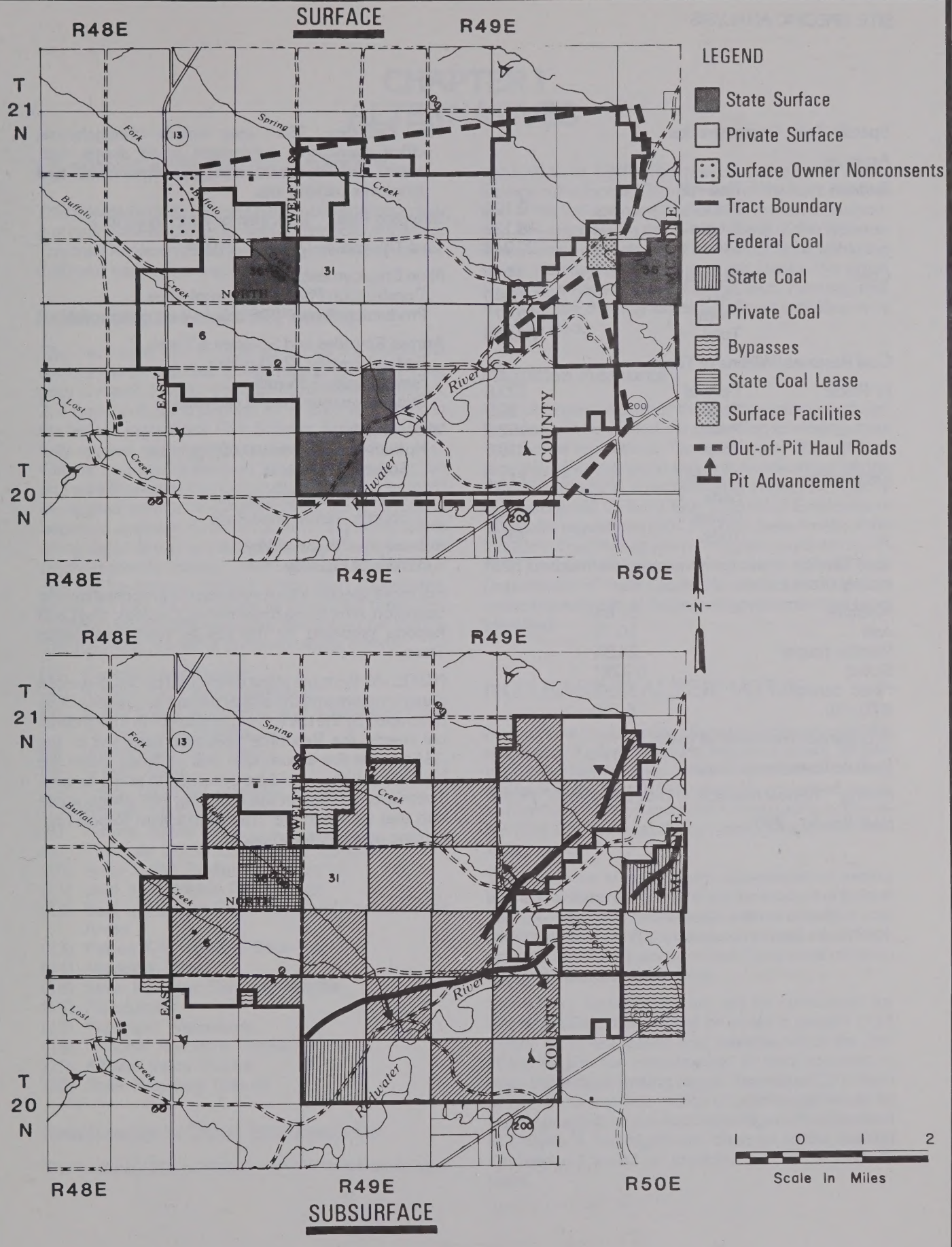
Total Ft. Union Coal Region



Area Shown On Map Above

★ Savage Mine

MAP 1



REDWATER TRACT II

MAP 2

Specific Tract Characteristics:

Acreage:

Surface:	Federal	0
	State	2,120
	Private	18,126
	Total:	20,246
Coal:	Federal	7,935
	State	1,840
	Private	10,471
	Total	20,246

Coal Reserves/Millions of Tons:

In Place:	Federal	123.6
	State	32.9
	Private	162.2
	Total	318.7
Recoverable:	Federal	111.2
	State	29.7
	Private	146.0
	Total:	286.8

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	31.6%
Ash	10.7%
Volatile matter	24.8%
Sulfur	0.22%*
Fixed carbon	32.9%
BTU's/lb	6,750

*Contained microveins of pyrite

Surface Disturbance/acres

Mining: Annual rate, 431.1; Total Life of Mine, 17,246

Haul Roads: 230

Mine Facilities: 160 - may include: changehouse, office warehouse, equipment repair shops, fuel, water and explosive storages, equipment and employee parking lots.

Stripping Ratio: Less than or equal to 20 to 1

Coal Thickness: Average, 10.5 ft.

Mine Employment:
Construction Phase - 175 employees
Production Phase - 300 employees (maximum)

Annual Royalties and Severance Taxes:
Federal Royalty, $2.09 million
State Royalty, $.55 million
State Severance Tax, $8.64 million.

Water Needs:
Human Consumption, 9,000 gal./day
Source: Well water

Nonpotable, 60,000 gal./day
Source: Yellowstone River

Relocation of Right-of-Way:
3 miles of highway

For more specific information on the proposed mining operation, refer to the Engineering, Geologic and Land Reports prepared by the USGS Tract Delineation Team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the Resource Specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

This alternative is to offer for further consideration federal coal in the Redwater II tract for competitive leasing. This tract has been identified as a logical mining unit for a 30-year surface mining operation.

Relationship to Land Use Planning

The tract does not include any lands for which the surface owner has filed a valid nonconsent to mining prior to March 1, 1981. Unsuitability criteria numbers 1, 2, 4 through 6, 8, 16 through 18, and 20, as defined in the federal regulations CFR Subpart 3461, have been fully applied to the private surface over federal coal. Criteria numbers 9 through 15 and 19 involving fish and wildlife are pending further study. These criteria will be applied prior to the Final EIS as the information becomes available. Criterion 3, involving buffer zones along rights-of-way and adjacent to dwellings, must be resolved prior to mining. Criterion 7 on cultural resources will be cleared through mine plan submission, which will include mitigation or avoidance measures. Current unsuitability concerns are shown on Map 3. The following is a list of the unsuitability criteria:

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

The tract contains two inactive mines which went out of production in 1968. The nearest active mine is the Savage mine located 20 miles east of the tract. Production of the Savage mine is about 0.3 million tons annually. The tract lies on the western flank of the Williston Basin oil and gas field. All of the federal lands within the tracts are subjected to oil and gas leases. No active leases or wells are located in the tract. Farming and ranching are the only other significant activities in or near the tract.

Mitigation Measures

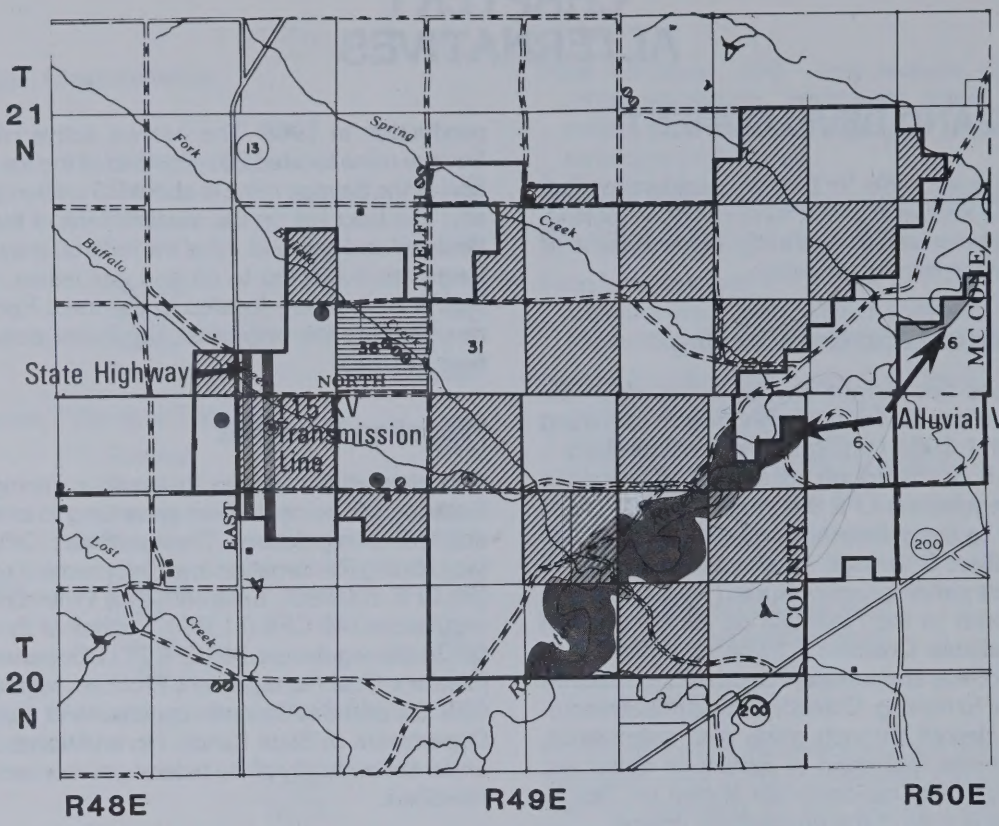
This alternative assumes that proper mining and reclamation will be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency regulations (40 CFR 0-1399), Council of Environmental Quality regulations (40 CFR 211), Department of the Interior's Coal Management Program regulations (43 CFR 23 and 3400), and regulations of the Montana Department of State Lands. No additional mitigation under the authority of the federal government has been identified.

NO LEASING ALTERNATIVE

Federal coal would not be offered for leasing under this alternative. Federal reserves represent about 39 percent and State reserves about 10 percent of the coal available in the tract. If federal coal is not leased, development of a large economical mining unit is not feasible (Ref. GS Redwater II Engineering Report for Redwater).

There were no small business expressions of leasing interest for the area. Considering the amount of federal coal involved, the checkerboard pattern of federal coal ownership and the apparent trend in small mine development, near future development of any small mines in the tract boundary is not likely.

Should the Redwater II tract not be considered for further leasing, there would be about 8 percent (124 million tons) less federal coal available within the Fort Union Region for consideration in tract selection to meet the federal leasing target. Also about 33 million tons of State and 162 million of private coal would be lost for possible production in the region. As discussed in Chapter II, few significant changes to the existing environment would be expected during the next 30 years.



Areas that may be declared unsuitable for surface mining based on existing information.

- By BLM
- By Others
- Federal Coal
- Leased State Coal
- ⊙ Potential Dwelling

1 0 1 2 3 4 5 6

Scale In Miles

-N-

REDWATER TRACT II

MAP 3

CHAPTER II
AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration and the trend is expected to continue. The physical resources described in this section represent only existing conditions while the social and economic sections account for existing conditions and ongoing trends. It is recognized that the physical resource values may change due to future oil and gas exploration.

TOPOGRAPHY

The landscape consists of a series of northwest trending, gently sloping ridges (Figure 1) grading into a relatively flat alluvial surface situated next to the meandering Redwater River. The river passes diagonally through the southern part of the tract. Some of the smaller drainages form steep-walled coulees in the northern part of the area. Elevations range from 2290 feet to 2580 feet.

GEOLOGY

The area is underlain by shales, sandstones, and lignite beds belonging to the Tongue River Member of the Fort Union Formation (Paleocene).

The S bed is the most important lignite seam occurring in the tract. The bed averages about 10.5 feet in thickness and gradually thins to the north.

Although no discoveries of other minerals have been made within the tract, the area is underlain by formations that are prospectively valuable for oil and gas. No other mineral values are known to occur within the tract.

SOILS AND RECLAMATION POTENTIAL

Soils within the tract are formed in sandstone, shale and alluvium. The soils occur along undulating to hilly and steep dissected sedimentary upland plains and on low terraces and alluvial fans. Profile development and depths vary due to climate, parent material and geomorphic stability.

There are 60 soil series in the tract surveyed by the Soil Conservation Service at level two in Dawson County and level three in McCone County. The soils are discussed in Table 1.

HYDROLOGY

Surface Water

The Redwater II tract lies mainly northwest of the Redwater River but some of the tract is southeast of the river. The Redwater River may be in an alluvial valley floor and declared unsuitable for mining. If this occurs, an appropriate buffer zone would have to be determined to protect the alluvial valley floor from degradation. The principal tributaries are South Fork Buffalo, North Fork Buffalo, Spring, and Corral Creeks (Map 2 shows boundary and drainage). Flow in the Redwater and its tributaries is intermittent; slightly more than 1,000 square miles of area upstream of the tract is drained by the Redwater. The Redwater had flow an average of about 262 days per year in the 1929-80 period of record. The tributaries are estimated to have flow 30 days or less per year. The annual flow in the Redwater River at the tract location is about 19,000 acre-feet (average annual runoff of 0.35 inches). Peak flows result from summer thunderstorms and from snowmelt in February through April. For the Redwater River, the 10-year peak flow is 4,900 cubic feet per second (cfs) and the 25-year peak flow is 7,500 cfs. The estimated annual yield and peak flows for the largest tributaries are as follows:

Watershed	Approximate area drained in square miles	Annual yield in acre-feet	Peak flow (10-year frequency of occurrence)
Unnamed tributary (joins Redwater River in Sec. 35, T21N, R49E	5	10	540
Spring Creek	17	320	1,060
North & South Forks Buffalo Creek	34	635	1,510

The chemical quality of flow most of the year in the Redwater River and its tributaries generally is too poor for human consumption without treatment. The dissolved solids content varies inversely with volume of flow, from as little as 200 milligrams per liter (mg/l) during periods of high snow-melt runoff in the spring to about 4,500 mg/l during periods of low flow in the winter. The water is dominantly a sodium sulfate type during all stages and seasons. The average dissolved solids content is about 2,500 mg/l, sodium about 600 mg/l, sulfate about 1,400 mg/l, and bicarbonate about 650 mg/l (years 1975-76, P. W. McKinley, 1979). The high content of dissolved ions is introduced to the surface flow through inflow of ground water of high dissolved solids content and through dissolution of salts precipitated by evaporation on the surface of the river banks.

Figure 1. Cultivated fields cover gently rolling hills in the eastern portion of the tract.

TABLE 1
REDWATER II
SOIL EROSION

SOIL MAPPING UNIT NAME	DEPTH 1/ SHALLOW 0-20"	DEPTH 1/ MODERATELY DEEP 20-36"	DEPTH 1/ DEEP 36+"	PERCENT SLOPE	SOIL EROSION POTENTIAL 1/ WIND	SOIL EROSION POTENTIAL 1/ WATER	SURFACE ACRES	PERCENT OF AREA	SOIL RECONSRT. POTENTIAL 2/	SOIL HAZARD CONDITIONS 2/	SUITABILITY OF SOIL MATERIAL FOR GROWTH (ACRE FEET) 3/ GOOD	FAIR	POOR
Alona silt loam			X	0-4	Low	Low	13	< 1	Poor	Excess lime and sodium	--	9	56
Alona silt loam			X	4-8	Low	Mod.	1	< 1	Poor	Excess lime and sodium	--	1	4
Alona silt loam, saline			X	0-2	Low	Low	11	< 1	Poor	Excess salts and sodium	--	7	48
Banks fine sandy loam			X	0-2	High	Low	417	2	Fair	Too sandy	555	1530	--
Bank of silty clay		X		2-8	Mod.	Mod.	18	< 1	Poor	Too clayey, excess lime	--	--	44
Bryant silt loam			X	0-4	Low	Low	1462	7	Poor	Excess lime, too clayey	848	1345	5117
Bryant silt loam			X	4-8	Low	Mod.	328	2	Poor	Excess lime, too clayey	190	302	1148
Bryant-Cambert complex		X(.05)	X(.95)	2-8	Low	Mod.	1110	6	Poor	Excess lime	699	910	3807
Cabba loam	X			15-25	Low	Mod.	417	2	Fair	Excess lime	--	626	--
Cabba-Badland complex; Zahill-Cabba loams	X(.52)	X(.11)	X(.37)	8-45	High	High	1643	8	Fair	Excess lime	187	4560	494
Cabba-Bank of complex	X(.51)	X(.42)	X(.07)	15-45	Mod.	Mod.	752	4	Poor	Excess lime,too clayey	15	572	925
Cabba-Brandenburg complex	X(.85)	X(.15)		8-45	Mod.	Mod.	32	< 1	Fair	Excess lime	9	26	8
Cabba-Dast complex; Macar-Cabba loams	X(.44)	X(.27)	X(.29)	8-45	High	Mod.	540	3	Fair	Excess lime	85	715	288
Cabba-Wabek-Dast complex	X(.35)	X(.25)	X(.40)	15-45	High	High	612	3	Poor	Excess lime, too sandy	1075	551	1077
Cambert-loam			X	2-8	Low	Mod.	3258	16	Poor	Excess lime	183	1368	13846
Cambert-Bank of Cabba complex	X(.20)	X(.33)	X(.47)	4-15	Low	Mod.	407	2	Poor	Excess lime, too clayey	115	216	997
Cambert-Cabba loams	X(.30)	X(.10)	X(.60)	8-15	Low	Mod.	639	3	Poor	Excess lime	223	588	1636
Cambert-Dast-Cabba complex	X(.20)	X(.30)	X(.50)	4-15	Low	Mod.	620	3	Poor	Excess lime	223	570	1314
Cherry silt loam; Zahill loam			X	0-8	High	Mod.	1367	7	Fair	Excess lime, too clayey	594	6242	--
Cherry silty clay loam; Farnuf loam			X	0-4	Low	Low	135	1	Fair	Excess lime, too clayey	129	546	--
Cherry silty clay loam		X	X	2-4	Low	Mod.	47	<1	Fair	Excess lime, too clayey	--	235	--
Cherry-Havrelon-Trembles complex Ridgelawn silt loam; Trembles fine sandy loam			X	0-2	High	Low	1048	5	Fair	Excess lime	847	4133	260
Cherry-Havrelon-Trembles soils, occasionally flooded			X	--	Mod.	High	129	1	Fair	Excess lime	--	645	--
Dast fine sandy loam		X		4-8	High	Low	117	1	Poor	Excess lime, droughty	--	88	126
Dast fine sandy loam		X		8-15	High	Mod.	29	<1	Poor	Excess lime, droughty	--	22	31
Havrelon loam; Havrelon silty clay loam			X	0-2	High	Low	350	2	Good	----	1750	--	--
Lehr loam			X	2-8	Low	Mod.	27	<1	Poor	Too sandy, excess lime	18	22	94
Lambert gravelly loam			X	20-40	Low	High	27	<1	Fair	Excess lime	--	135	--
Lambert silt loam			X	2-8	Low	Mod.	301	2	Fair	Excess lime	--	1505	--
Lambert silt loam			X	8-15	Low	High	373	2	Fair	Excess lime	--	1865	--
Lambert-Badland complex	X(.40		X(.60)	20-80+	Mod.	High	146	1	Poor	Excess lime	--	412	16
Lambert-Dimyaw complex			X	15-65	Low	High	88	<1	Poor	Excess lime, too clayey	--	252	168
Lisk sandy loam; Macar loam			X	0-15	High	Mod.	201	1	Fair	Excess lime	318	648	39
Macar-Cambert loams		X(.10)	X(.90)	2-8	High	Mod.	202	1	Poor	Excess lime	222	325	428
Shambo loam			X	0-4	Low	Low	373	2	Good	----	1585	--	152
Shambo loam			X	4-8	Low	Mod.	263	1	Good	----	1118	--	197
Shambo-Cabba loams	X(.40)	X(.10)	X(.50)	8-15	Low	Mod.	141	1	Good	----	242	128	96
Shambo-Cambert loams		X(.05)	X(.95)	2-8	Low	Mod.	1042	5	Good	----	2355	406	2355
Typic Fluvaquents, soils			X	0-2	To Var	To Var	94	<1	---	Too variable to rate	--	--	--
Typic Fluvaquents, saline			X	0-2	Low	Mod.	47	<1	Poor	Excess lime	--	--	235
Ustorthents-Ustifluvents assc.			X	--	To Var	To Var	81	<1	---	Too variable to rate	--	--	--
Vida clay loam			X	0-2	Mod.	Low	42	<1	Poor	Excess lime, too clayey	7	60	143
Vida clay loam			X	2-8	Mod.	Mod.	5	<1	Poor	Excess lime, too clayey	1	7	18
Vida Zahil complex			X	2-15	Mod.	Mod.	952	5	Fair	Excess lime, too clayey	102	4065	362
Vida-Zahill complex, undulating			X	--	Low	High	79	<1	Poor	Excess lime, too clayey	2	114	279
Wabek sandy loam			X	4-15	High	Mod.	9	<1	Poor	Too sandy, droughty	5	--	40
Zahill loam	Soil Depths			Soil Erosion Potential				Soil Reconstruction Potential			Suitability of Soil Material for Pla		
Zahill loam			X	15-45	High	High	24	<1	Fair	Excess lime, too clayey	--	120	--
Totals:							20,246	100			13,687	37,006	35,847

Soil Depths	Soil Erosion Potential		Soil Reconstruction Potential	Suitability of Soil Material for Plant Growth
	Wind	Water		
Shallow - 13%	Low - 59%	Low - 20%	Good - 11%	Good - 14%
Mod. Deep - 8%	Mod. -11%	Mod. - 64%	Fair - 40%	Fair - 37%
Deep - 79%	High -34%	High - 16%	Poor - 49%	Poor - 35%
				Unsuitable - 14%

1/ Soil Depth Classification and Soil Erosion Potential is derived from Dawson County Soil Survey

2/ Soil Reconstruction Potential is derived from the National Soils Handbook.

* Too variable to rate.

3/ Depth (in acrefeet) of available soil calculated from acres x acrefeet/acre = suitability of soil material for plant growth.

The chemical quality of flow in the tributaries in the tract is not known but probably is similar to flow in the Redwater, with a possibility of more highly concentrated sodium sulfate water.

The flow of the Redwater River and its tributaries is used by wildlife and for stock watering most of the year. Flow in the Redwater is used also for irrigation, but only when the volume is great enough and the chemical quality is suitable.

Groundwater

The principal aquifers are the near-surface units comprising alluvium, including terrace gravel deposits, Tongue River, and lower Fort Union aquifers, and the deeper Fox Hills-lower Hell Creek aquifer. Water contained in the alluvial aquifer is unconfined (water-table conditions) but water in the other near-surface aquifers is semi-confined to confined and in the deeper aquifer is confined (artesian conditions).

The alluvial aquifer is a water-bearing deposit of gravel, s nd, and silt along the Redwater River and its larger tr utaries. The aquifer is as much as 50 feet thick and well yields generally range from 3 to 10 gallons per minute (gpm). The Tongue River aquifer consists of 500 to 600 feet of sandstone, siltstone, shale, coal, and clinker beds. The sandstone, coal, and clinker beds yield from 2 to 50 gpm to wells. Underlying the Tongue River aquifer is the lower Fort Union aquifer comprising 500 to 560 feet of bedded shale, siltstone and shaly sandstone; the lower Fort Union is not tapped by wells in the tract, but well yields probably would be about 2 to 10 gpm. The direction of groundwater flow in the near-surface aquifers is controlled by topography; the flow is generally toward the Redwater River and its major tributaries, which are discharge areas for groundwater in the near-surface aquifer system. The groundwater is a sodium-sulfate or -bicarbonate chemical type and the dissolved solids content is high, ranging from about 1,000 to 4,000 mg/l. Within the tract boundaries, nine stock and three domestic wells are known to tap the near-surface aquifers. Outside the boundaries, but within one mile of the boundaries, are at least five stock and five domestic wells.

The top of the Fox Hills-lower Hell Creek aquifer underlies the land surface at depths of about 1,000 to 1,200 feet. The aquifer is separated from the near-surface aquifers by the upper Hell Creek confining layer, which is about 350 feet thick and consists of shale and siltstone. The Fox Hills-lower Hell Creek aquifer is a fine-to-medium-grained sandstone and contains shale, shaly siltstone, and thin coal beds. In the Fort Union coal region, well yields from this aquifer are as much as 200 gpm. Ground-water flow is controlled by the geologic structure of the aquifer and the surface of the underlying Bearpaw confining layer, and the flow direction is to the east-northeast. The dissolved solids content of the groundwater is about 1,000 mg/l and sodium and bicarbonate are the dominant ions. Two public supply wells in the town of Circle, Montana, near the southwest corner of the tract, are known to tap this aquifer.

LAND USE

Vegetation and Agricultural Production

Agricultural operations in this area consist of: (1) livestock and (2) small grains and livestock (see Table 2). Most of the cropland in this area is dry-farmed with small areas being irrigated. A crop-fallow system is used in the dry farmed area with mainly wheat or barley being grown. Small acreage is used for other small grains, forage crops, potatoes, flax or pasture.

TABLE 2[1]
Agricultural Land Use

Land Use	Tract Acres	Average Production Per Acre	Total Annual Production
Cropland	3,760	28.4 bushels	106,784 bushels
Hayland	259	1 ton	259 tons
Range	12,415	0.277 AUMs	3,439 AUMs
Other[2]	533	55 bushels	27,940 bushels
Fallow	3,279	0	0
Total	20,279		

[1]Data collected from Dawson County Agriculture Stabilization and Conservation Committee, Glendive, Montana, 1981.

[2]508 acres, oats; 25 acres, homesteads, etc.

There are 13 agricultural operators who have some or all of their operation within the tract. However three agricultural operators have no cropland within the tract (Table 3). Only 24.8 percent of the total cropland of these operators lies within the tract. This pattern varies greatly by operator. For example: the largest operator has 13,811 total acres (2,099 acres of cropland) with only 7,407 acres (1,189 acres of cropland) or 53.6 percent of the operation included in the tract while the smallest operator has 958 acres (873 acres of cropland) with only 240 acres (155 acres of cropland) or 25.1 percent of the operation included in the tract. However, one operator has 10,627 acres (6,970 acres of cropland) with 3,145 acres (1,668 acres of cropland) or 29.6 percent of the operation included in the tract. This operator has the largest acreage of cropland.

Approximately 61 percent of the tract is native rangeland, indicating that livestock grazing is an important part of the overall agricultural land use picture. All of the agricultural operators have at least some rangeland, varying from 6,218 acres to as few as 14 acres (see Table 3). As a group, the operators depend on the tract for 45.5 percent of their rangeland needs.

The average annual production of native forage on the tract is estimated to be 3,439 AUMs. Assuming that the hay produced on the tract will be fed to the operator's livestock, an additional 1,036 AUMs would be available for livestock use in the winter months. Winter grazing on the croplands varies tremendously depending on the amount of moisture and duration of cold weather. Under ideal conditions, at least 797 AUMs would be available for fall and winter grazing. Normally, only about 300 AUMs are available on the tract croplands due to the difficulty of providing water for livestock during the winter months.

The croplands on and near the tract have an impact on wildlife numbers, especially for white-tailed deer and pronghorn antelope. The edge effect of croplands and native vegetation benefits deer, pronghorns, some game birds and non-game wildlife. However, a combination of varied terrain and native vegetation provide yearlong habitats for most of the wildlife species found in the area.

The vegetation on the tract is typical of the Prairie County grassland with influences from the northeast grassland (Payne). The most prominent subtypes are steppe grassland and silver sagebrush. Cottonwoods and riparian shrub areas along the Redwater River and its tributaries were not separated from the above subtypes. Silver sagebrush and badlands areas are the two other subtypes found in the tract. Nearly 67 percent of the tract is in good condition, leaving about 33 percent in fair or poor condition (McCone County Conservation District, 1976).

Agricultural Economics

This section will be forthcoming under separate cover.

Residential and Farm Structures

Approximately 5 residential homes, and 19 outbuildings and grain bins exist within the unit. These areas are serviced by existing underground telephone cables and overhead electrical transmission lines.

Transportation and Access

Good transportation access is available within and near the tract. State Highways 200 and 13 pass through the unit. Several seasonal and all weather county and private roads traverse through the unit. In addition, the Burlington Northern Railway is located 10.5 miles to the southwest near Circle, Montana.

Existing Rights-of-Way (Corridors)

A 115 KV transmission line passes through the unit adjacent to State Highway 13 about seven miles west of the plant site (see Map 3). A 230 KV transmission line is located 8.5 miles southwest of the plant site. The proposed route of the Northern Tier Pipeline is approximately 12 miles northwest of the tract.

RECREATION

The only known recreational pursuit in this tract is seasonal hunting. Sportsmen using this area must acquire landowner permission prior to entry. Access into the tract is by dirt road or trail. There are no recreational facilities or wilderness values present.

WILDLIFE AND FISHERIES

A basic wildlife inventory encompassing this tract is in progress; it is being funded by WESCO and is being done by Western Technology and Engineering, Inc. Until this study is completed (December, 1981), received, and determined to be adequate by BLM, all the wildlife values of the tract cannot be assessed. The occurrence of and use by threatened and endangered species, furbearers, song birds and upland game cannot be determined until this inventory is complete.

The tract includes parts of big game hunting Districts 650, 732, and 733. Available distribution information indicates good use by pronghorn in summer (Montana FW & P, 1980), but no appreciable winter deer concentrations on the tract (Montana FW & P, 1980). A fisher-

TABLE 3

REDWATER II

FARM/RANCH OPERATIONS 1/

OPERATOR	INSIDE COAL TRACT (acres)							OUTSIDE COAL TRACTS (ACRES)							
	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF THE OPERATION WITHIN THE TRACT
1	129	0	14	129	2	274	0	441	0	190	441	8	1,080	1,354	20.24
2	150	3	18	109	0	280	100	227	0	1,241	170	0	1,638	1,918	14.60
3	463	43	229	399	0	1,134	100	1,694	174	1,187	1,425	0	4,480	5,614	20.20
4	687	2	124	671	20*	1,504	100	38	0	2	38	0	78	1,582	95.07
5	260	0	34	186	0	480	0	1,789	0	211	1,326	0	3,326	3,806	12.61
6	508	211	1,231	248	0	2,198	14.47	707	66	786	506	0	2,065	4,263	51.56
7	57	0	51	52	0	160	0	1,574	179	2,243	1,238	0	5,234	5,394	2.97
8	77	0	85	77	1	240	0	358	0	0	358	2	718	958	25.05
9	96	0	50	94	0	240	0	1,896	139	734	1,266	0	4,035	4,275	5.61
10	375	0	6,218	375	439	7,407	22.41	299	0	5,494	299	312	6,404	13,811	53.63
11	148	0	26	147	5*	326	0	732	0	137	729	0	1,598	1,924	16.94
12	0	0	2,858	0	0	2,858	75.72	0	0	494	0	0	494	3,352	85.26
13	810	0	1,477	792	66	3,145	100	2,637	0	2,180	2,585	80	7,482	10,627	29.59
TOTAL	3,760	259	12,415	3,279	2/ 533	20,246		12,392	558	14,899	10,381	402	38,632	58,878	

1/Data collected from McCone and Dawson Counties Agriculture Stabilization and Conservation Committees, Circle and Glendive, Montana, 1981.

2/508 acres, oats; 25 acres homesteads, etc.

* Homesteads, etc.

ies inventory has been completed by BLM. Although the Redwater River is an intermittent stream, many large pools remain when there is no flow. These pools provide fishing for walleye, northern pike and other species for people living in the area. The lower reaches are used as a spawning area for fish that migrate up from the Missouri River. There are no public access fishing ponds on the tract managed by state or federal agencies.

CULTURAL RESOURCES

The Redwater II tract has not been systematically inventoried to date. Information from existing inventories (Davis 1976, Greiser 1980, BLM unpublished data) suggests that the predominant prehistoric sites should be lithic scatters of varying size, density and function (ca. 70-80%). Other expected prehistoric sites include stone circles (ca. 10%), ceramic-bearing sites, rock shelters and bison kills (ca. 10% combined). Expected historic resources include homestead and ranching remains (ca. 50%), historic grafitti and rock art (ca. 20%), freight roads, dugouts, stone cairns, trading posts, burials and battle sites (ca. 30% combined). Further information on cultural resource occurrence, distribution and significance cannot be quantified prior to inventory.

BLM-sponsored contract inventory in the Fort Union Coal region is scheduled for the summer of 1981 to generate information sufficient to identify and predict the nature, occurrence and significance of cultural resources in the tract in the regional EIS. Subsequent to inventory and prior to the regional EIS, BLM will apply unsuitability criterion 7 (43 CFR 3461.1 [g]) to all identified properties and will consult with the Montana State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) regarding the effect of coal leasing on National Register-eligible properties, in accordance with the ACHP Programmatic Memorandum of Agreement with BLM, OSM and USGS, Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended).

VISUAL RESOURCE MANAGEMENT

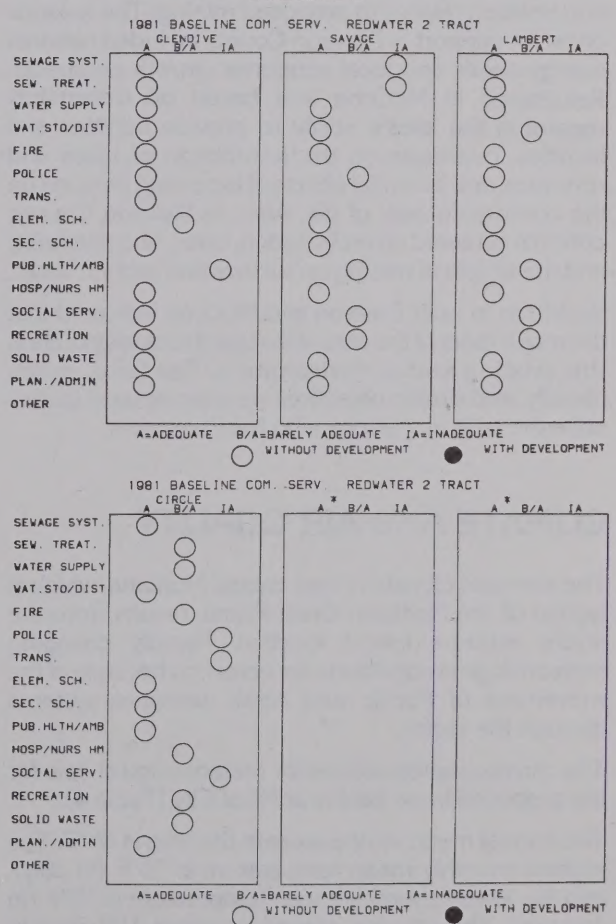
Along the Redwater River the topography is rolling and the predominent vegetation is prairie grasses. The northern and eastern portion of the unit is level enough for dryland farming. Two paved roads pass through the area and numerous man-made intrusions (houses, powerlines, fences) are visible to the casual observer.

ECONOMIC AND SOCIAL CONDITIONS

Existing and forecasted population and employment levels for the communities of Lambert, Savage, Circle, and Glendive, Montana are shown in Figure 4(in Chapter III). As this figure shows, future population levels in these communities without energy development (refer to dashed line) are expected to either decline somewhat or remain relatively stable from 1981 through 2000.

These communities are small agriculturally oriented towns which do not have the capability to accommodate any significant population growth without some strain on public services. As Figure 2 shows, several of the above communities are presently (1981) experiencing some problems in providing an adequate or barely adequate level of one or more types of public services. For example, Savage and Circle are currently experiencing inadequate sewage treatment facilities for their present population.

FIGURE 2



SOURCE: Respective city/county or regional planners.

Major existing service problems in Dawson County, as perceived by residents, are shopping opportunities, medical care, recreation and entertainment opportunities. Recreation facilities and programs, road maintenance, and shopping opportunities were listed by residents in McCone County as being those factors most problematic at this time.

Support for coal mining in the area is higher in Dawson than it is in McCone County. Roughly 4 out of 5 persons interviewed in Dawson County either supported development without qualification or supported it with qualifications. Usually this qualification was based on assumed successful reclamation of the land. In McCone, roughly two-thirds of the residents supported development either with or without qualification. In both McCone and Dawson counties (nineteen and thirty-six persons interviewed respectively), the reasons given for this support focused typically on the need for local economic growth and stability and the national need for energy production.

Leaders in Dawson were much more supportive of development than were leaders in McCone, where leaders were reluctant to take a supportive or opposition position relative to proposed mining. The reasons given for support in Dawson County included national energy needs and local economic growth prospects. Reluctance in McCone was based on uncertainty regarding the area's ability to provide services and facilities, questions on the distribution of taxes and revenues, and potential effects of incoming persons on the community way of life. Also, in Dawson County, concern centered on reclamation, taxes, and revenues, and the effects of mining on surface and ground water.

Residents in both Dawson and McCone indicated that the major asset of the area with regard to quality of life is the existing social environment. Peaceful, quiet, friendly, and similar objectives were terms used to describe the area by persons who live there now.

CLIMATE AND AIR QUALITY

The semiarid climate of east central Montana, which is typical of the Northern Great Plains, results from the area's extreme inland location. Rapidly changing meteorological conditions are common because of the movement of Pacific and Arctic pressure systems through the region.

The climate station utilized for meteorological data for the proposed lease tract is at Miles City (Table 4).

The annual mean temperature in the area is 46°F. The highest monthly mean temperature is 75°F (in July), and the lowest monthly mean temperature is 15°F (in January). The growing season averages 158 days at Miles City.

TABLE 4
Meteorological Data for Selected Sites*

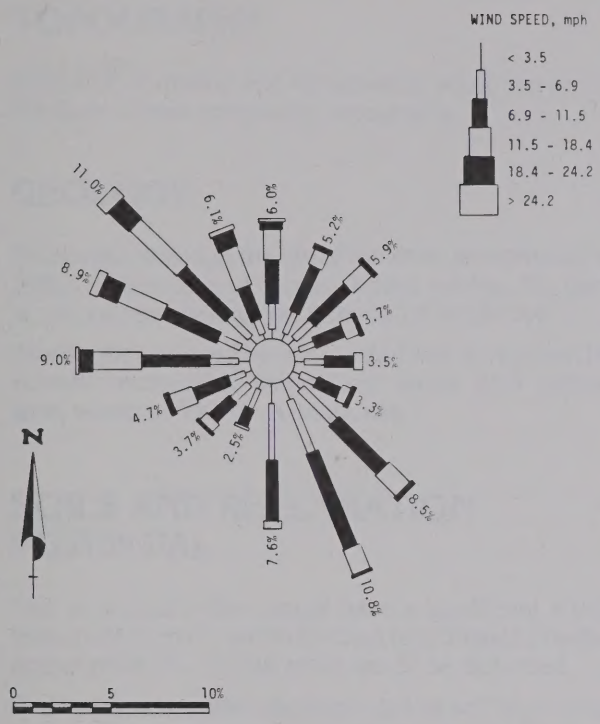
	Miles City
Temperature, °F	
Mean Annual	46
Mean Monthly Minimum (Jan.)	15
Mean Monthly Maximum (July)	75
Growing season for Grass (temperature 32°F), days	158
Precipitation, in.	
Annual Average Rainfall	14.2
Monthly Range Rainfall	0.5-3.1
Annual Snowfall	32.2
Average No. of mo/yr with Snowfall	10
Annual Stability (by class), % occurrence	
Class A, B, C	15.8
Class D	54.3
Class E, F, G	29.9
Wind Direction	SE-S, 27% W-NNW, 35%
Windspeed, mph (% of time)	0-3.5 (8.4) 3.6-6.9 (23.3) 7.0-11.5 (39.6) 11.6-18.4 (21.3) 18.5-24.2 (5.5) 24.3 (1.8)
Average Windspeed, mph	10.6

*Sources: National Oceanic and Atmospheric Administration, 1980
Powder River Site Specific Analysis, 1981

Precipitation in the area is quite light. Most of it is in the form of rain in late spring and early summer. Annual rainfall totals about 14.2 inches, and snowfall about 32 inches.

Wind data used in this analysis were obtained at Miles City, the only station in the area that had data suitable for input into the dispersion model used. The wind rose in Figure 3 represents a summary of these data. Winds are predominantly from the W to NNW 35 percent of the time and from the SE to S, 27 percent. Windspeed averages 10.6 mph annually and exceeds 11.5 mph 28.6 percent of the time.

FIGURE 3



Miles City Wind Rose

Although the terrain offers little obstruction to the dispersion of pollutants, the area experiences prolonged periods of depressed mixing heights and low windspeeds, which tend to concentrate pollutants.

According to total suspended particulates (TSP) monitoring data, annual geometric mean in this area is 25.9 ug/m^3 and the arithmetic mean is 42.5 ug/m^3. The sparse population in the area precludes consideration of the sampler as an urban impacted site. The background level for this analysis was determined to be 42.5 ug/m^3.

No Class I areas fall within the impact range of the proposed tract. Visibility in the area ranges from 45 to 70 miles.

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

Evidence of mining and reclamation would remain in the form of less contrasting topography.

GEOLOGY

Production through the life of the mine is estimated at 286.2 million tons of lignite. During mining, the tract would be temporarily committed to a single use.

The lignite removed by mining and that portion left by current recoverable techniques, about 31.9 million tons, would be lost from future use.

SOILS AND RECLAMATION POTENTIAL

The proposed action would have a significant short-term impact on the soil in the tract (see Table 1). By the end of mine life, 20,246 acres would be disturbed.

Soil impacts include: displacement of soil from wind and water erosion, change in soil structure and natural fertility, soil compaction from haul roads.

In the tract, 55 percent of the soil has a low potential displacement by wind erosion and 64 percent of the soil has a moderate potential displacement by water erosion (see Table 1). Proper seeding of the stockpiles would reduce this erosion potential.

Disturbances of the soil would result in alterations of soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be affected by disruption of the nutrient cycle and a decrease in organic matter content within the soil. Salinity content would increase as a result of the lower calcareous horizons being brought to the surface.

The soil profile reconstruction potential is derived from the National Soils Handbook (USDA). The soil hazard conditions determine the reconstruction potential. The tract is rated as 11 percent good, 40 percent fair and 49 percent poor for reconstruction. Suitability of the soil material for plant growth is rated as 14 percent good, 37 percent fair, 35 percent poor and 14 percent unsuitable (see Table 1). The clay content of the overburden may be a problem. More sampling and analysis will be required to determine the need for selective handling of the spoils to meet state-federal guidelines. The soils rated poor can be reclaimed, but would require more intensive and costly management to be revegetated and stabilized.

HYDROLOGY

The industrial water supply for mining can be obtained from pit dewatering and/or from wells that tap the near-surface aquifers in the vicinity of mining. However, mining and use of this water could have a short-term impact on other nearby wells that tap the same aquifer. A supply of mine drinking water can be obtained from the Fox Hills-lower Hell Creek aquifer; no impact to other wells is anticipated from this minor withdrawal. An anticipated increase in public water supply of about 235 acre-feet/yr would be needed for the population increase associated with the mine. This additional amount probably can be supplied from the Fox Hills-lower Hell Creek aquifer without impacting other users. All existing wells that tap the near-surface aquifers within the tract boundary would be destroyed and, could be replaced by wells that tap deeper aquifers. Water levels in wells that tap the deeper aquifer would be nearer to the surface than water levels in existing wells. Additionally, the chemical quality of water in the deeper aquifer is better for public supply than that from the near-surface aquifers. All wells that tap the near-surface aquifers within one mile of mining may suffer lowered water levels during the mining process. For those wells that are impacted, water levels should recover within a few years following mining and reclamation. Existing stock ponds would be destroyed and lost for use during mining in that locality. Following mining, the stock ponds could be reclaimed.

The quality of water in the Tongue River aquifer is likely to be of poorer chemical quality following mining and replacement of spoils because of mixing of shale and sandstone, and increased solution of ions from the replaced spoils. Because the Redwater River is and would be the discharge area for ground water moving through the Tongue River aquifer, the chemical quality of flow in the Redwater could be degraded. The mined area drainage is about 2-1/2 percent of the total drainage area upstream of the tract but the potential degradation cannot be calculated without knowing how much inflow to the Redwater now is provided by the Tongue River aquifer.

LAND USE

Vegetation and Agricultural Production

The leasing and development alternative would have a significant short-term impact on individual agricultural operations in the tract. By the end of the mine life, 20,246 acres of the tract would be disturbed, in addition to 160 surface acres used for mine facilities.

An average of 106 acres of cropland, excluding summer fallow, would be removed from production each year. This would be an average annual loss of 3,101 bushels of wheat. This 106 acres of cropland would be out of production ten to fifteen years with a maximum of 1,067 to 1,622 acres out of production in any one peak mining year, resulting in a maximum loss of 30,303 to 46,065 bushels of wheat annually.

Peak mining year disturbance of 259 acres of hayland would result in an annual loss of 259 tons of hay production.

Further analysis of Table 3 reveals that loss of hay-producing areas would have a major impact on two of the four operators that raise hay on the tract. Although hay production in the tract represents nearly 32 percent of the total hay produced, only one operator would be severely impacted by the proposed coal mining project. Much more significant is the loss of summer rangeland, which impacts all 13 operators adversely in varying degrees.

An average of 309 acres of rangeland would also be removed from production each year, resulting in an average loss of 86 AUMs. This 309 acres of rangeland would be out of production ten to fifteen years with a maximum of 3,104 to 4,718 acres out of production in any one peak mining year, resulting in a maximum annual loss of 860 to 1,307 AUMs.

Seven of the operators lease land inside the tract. Four operators lease all of their operations while the other three lease 14 percent, 22 percent and 75 percent of their in-tract holdings, respectively. All seven operators would be moderately to severely impacted by the proposed project.

Regionally, these losses would not pose significant reductions in area agricultural production. Analysis of economic impacts, both to individual operations and regionally will be forthcoming under separate cover.

In addition to the loss of forage to surface mining operations, the related impacts would further affect the area. The plant species found there have mutual relationships among themselves and to their environment. Some species may never adapt to the changed environment. Management of plant species that survive the mining operation would require knowledge and application of ecological principles (Oosting, 1956).

Chief items of concern on the tract are the riparian shrub areas. These areas are vital to many wildlife species, and there is doubt that they can be restored after mining and subsequent reclamation.

The Montana Department of State Lands will set the standards for establishing a diverse, effective, permanent vegetation cover on all rangeland areas, with coordination and cooperation from the Office of Surface Mining and the Bureau of Land Management.

Agricultural Economics

This section will be forthcoming under separate cover.

Residential and Commercial Structures

A 300-foot buffer zone would have to be maintained on five residential homes unless waived by appropriate authority.

Transportation and Access

Access is available to the mine facility via existing county roads and private jeep trails from State Highway 13 to the west and State Highway 200 to the south. All or portions of these roads would have to be upgraded to accommodate heavy traffic and all-weather use. Approximately 28 miles of private and county roads, and two miles of state highways would have to be relocated or a 100-foot buffer zone maintained. In addition, about 19 miles of out-of-pit haul road would be required, most of which would be outside the tract boundary.

The major impact on the present transportation system due to mining at Redwater II would result in increased accident rates, system deterioration, rising maintenance costs, and decreased efficienty if not mitigated.

Traffic volume on Highways 200, 200-S and 13 would increase proportionately to construction and mining activities. Fluctuations would occur relative to the degree of overlap between mining and construction activities. Traffic would be expected to be heavy between the town of Circle and the tract when shift changes occur.

Existing Rights-of-Way and Needs

A 115 KV transmission line 7 miles to the west and a 230 KV transmission line 8.5 miles to the southwest may be used to transmit additional electrical energy. Rights-of-way to these facilities would be required. The right-of-way for the proposed Northern Tier Pipeline 12 miles northwest may be feasible for an additional right-of-way for transmission lines; however, rights-of-way would be needed to this corridor.

RECREATION

Seasonal sportsmen may be displaced during the mining phase. In general, leasing this tract would not impact the BLM recreation program. The addition of new mine employees would influence off-site recreation facilities. It seems fair to suggest that these new recreationists would result in increased pressure at surrounding facilities.

WILDLIFE AND FISHERIES

The Redwater River is being considered as an alluvial valley floor and may be declared unsuitable for surface mining (Map 3). If declared unsuitable, the impacts to wildlife and fisheries would be limited to those occurring from increased human populations based on existing information. If mined, the Redwater River would be diverted. This would result in an absence of a nearby fishing area for the residents of Circle and other small towns. The spawning areas downstream would probably be impacted when the stream is diverted during mining. If the drainage can be adequately reclaimed, these could be short-term impacts.

A significant potential exists to improve the area after mining. The area could be reclaimed into a series of waterfowl and fish ponds extending as far as three linear miles. The amount of wildlife and fish that would be produced could turn this into a major year-round outdoor recreation area. Most of the surface is in private ownership with only a very small portion of the state land which may make this difficult to achieve.

Poaching and road kills have increased dramatically in areas of Montana, Wyoming and Colorado where energy development has occurred. The problem is compounded in areas where shift changes coincide with feeding periods, especially big game (Streeter, et al., 1979). The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM would be to provide mass transportation of workers and adjusting the times of shift changes which would greatly reduce poaching. This has been used successfully in other mining areas (Streeter et al. 1979). Providing funds for the Montana Department of Fish, Wildlife and Parks to increase law enforcement and adoption of a poaching clause in union contracts would also help solve the problem.

Proposed road locations would result in road kills of wildlife as well as further destruction of habitat.

As a result of disturbance and the reductions in wildlife numbers through direct mortality and habitat destruction, recreational opportunities such as wildlife viewing and hunting would be reduced in the area around the mine. Impacts to other wildlife would be insignificant based on existing information.

CULTURAL RESOURCES

Until a systematic inventory of cultural resources in the tract is completed, no definitive assessment of impacts can be made. All cultural resources within the tract would be subject to direct impact from construction of mine facilities, haul roads, power lines, water development, and mining activity. Cultural resources not immediately impacted by the above activities are subject to impacts from increased erosion, access and vandalism. Direct impact would result in damage and destruction to cultural resource sites, artifacts, their immediate environmental context and the information these contain. Subsurface cultural resources not previously located by surface inventory would also be destroyed.

Should the tract be leased, a mitigation program would be undertaken for all affected cultural resources. Development of avoidance and preservation alternatives is preferred, as these would minimize impact to cultural resources. If these alternatives are not feasible, a scientific program of data retrieval will be developed and implemented for all cultural resources within the tract.

VISUAL RESOURCE MANAGEMENT

The visual disturbance associated with mining would involve several landscape components. The obvious intrusion will be 20,246 acres disturbed by mining, plus 390 acres needed for out-of-pit facilities. The necessary equipment and facility needs associated with this project (i.e., draglines, coal haulers, bulldozers, warehouses, offices, storage zones parking lots, etc.) would likely become a visible feature. The addition of utility corridors (for powerlines and water) would also add to the visual congestion surrounding this project. Particle pollution (dust) would likely be a spin-off effect of mining.

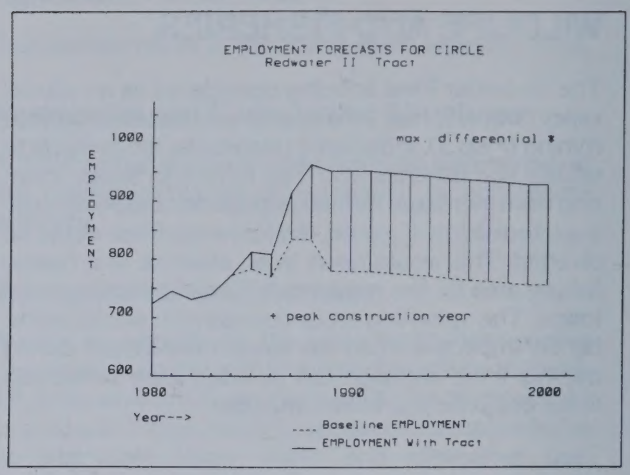
NET ENERGY ANALYSIS

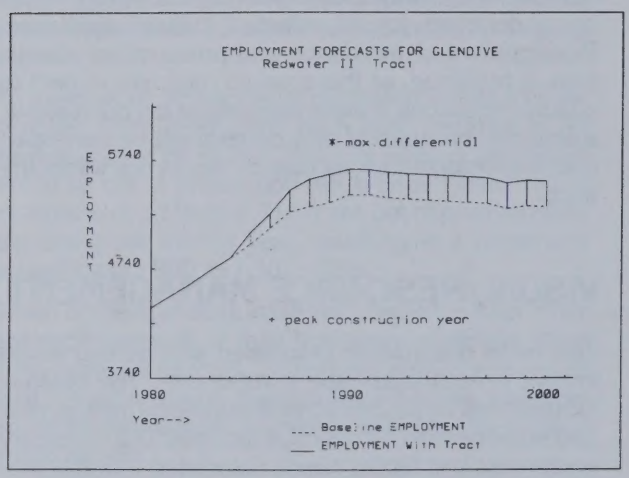
A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal would, in turn, produce about 6,750 Btus. The ratio of energy expended to that energy produced is 1 Btu/179 Btus.

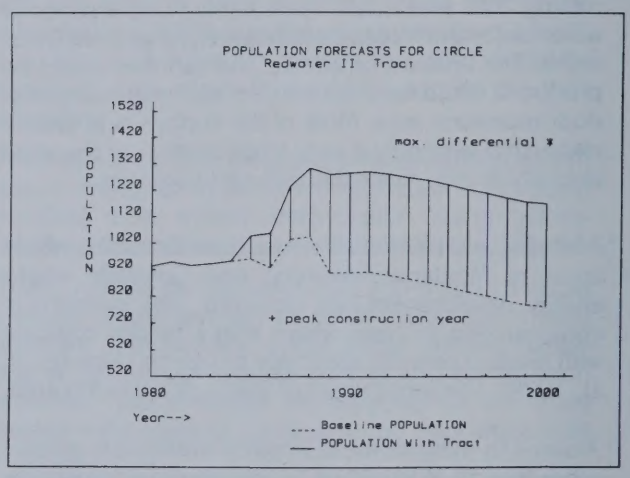
ECONOMICS AND SOCIAL CONDITIONS

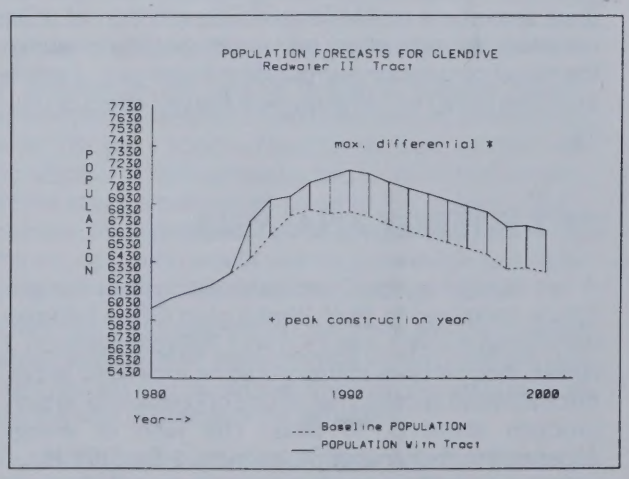
Construction and operation of the Redwater II tract would result in significant impacts upon services in some communities within the areas as a result of population growth associated with employment opportunities. Figure 4 shows forecasted community employment and population levels through 2000 both with and without development of the Redwater II tract. As these figures show, Lambert, Savage, Circle and Glendive, Montana would experience a significant increase in both population and employment as a result of development of the tract.

FIGURE 4









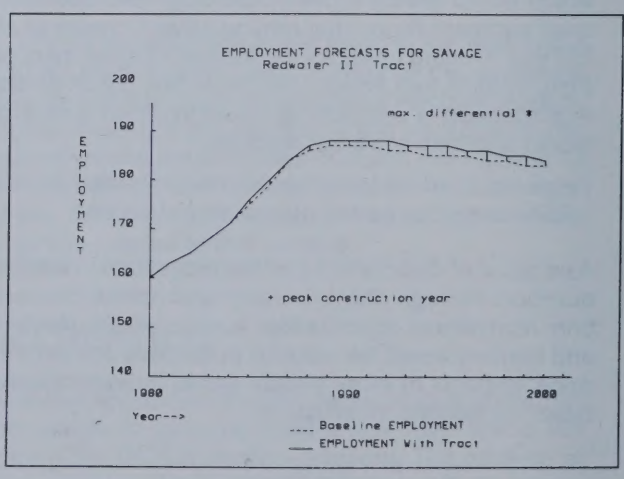
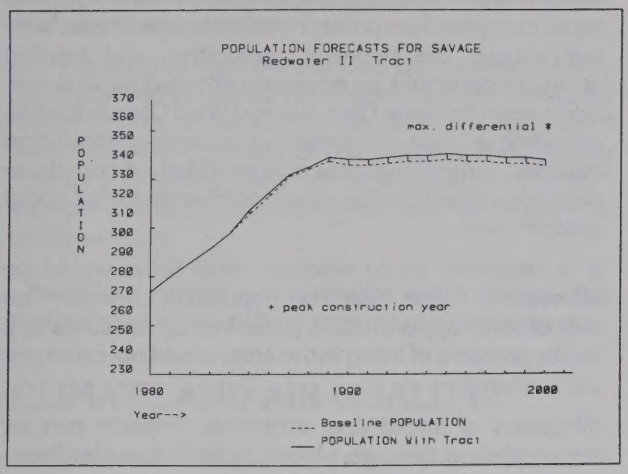
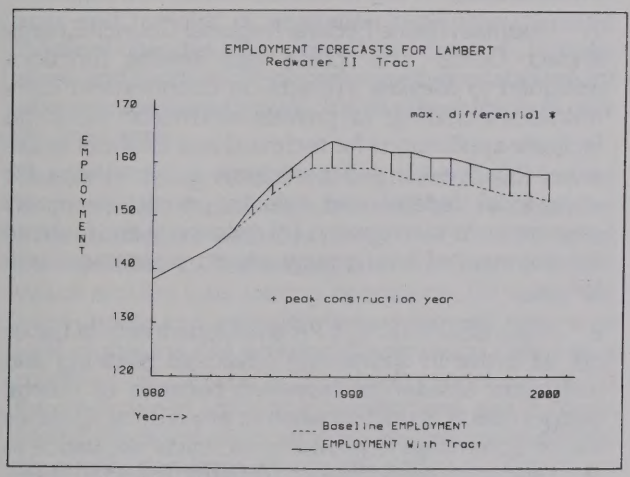
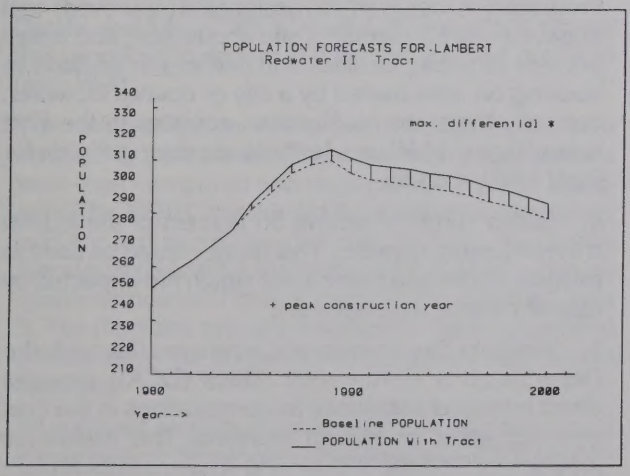


FIGURE 4 (continued)





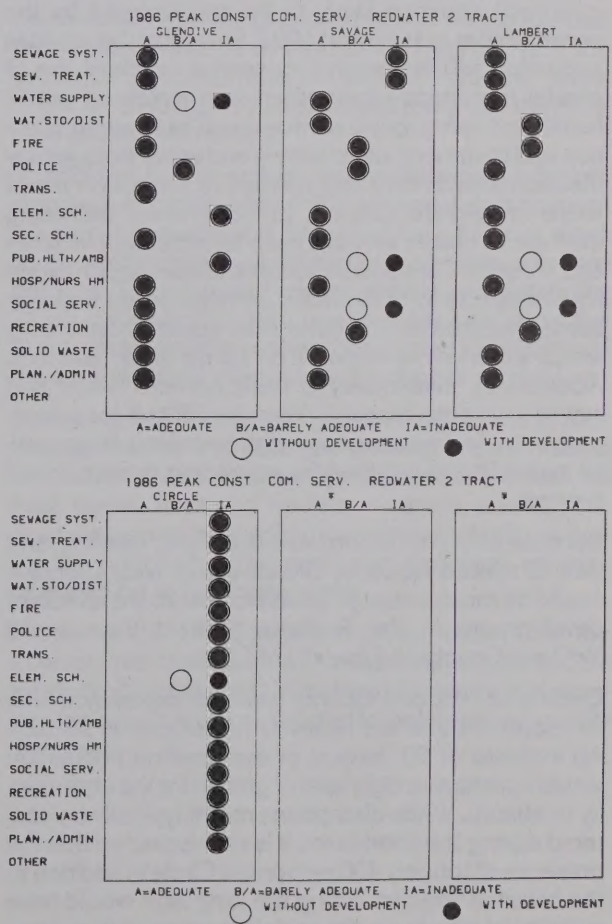


SOURCE: Mountain West Research, Inc., 1981.

Changes in regional personal income from tract development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employment payroll expenditure and through company expenditures for goods and services during the construction and operation phases. The Redwater II tract is forecasted to boost regional personal income by a maximum of 0.4 percent over baseline values by 1989 and beyond as a result of expenditures associated with the operations phase of this tract.

Peak employment during the construction phase of the Redwater II tract is expected to occur in 1986 at 210 employees with full operations employment expected in 1991 at 300 employees. Using 1986 as the first primary impact date, it is estimated that the communities of Lambert, Savage, Circle, and Glendive would experience an inadequate level of one or more community services as a direct result of the 1986 peak construction employment/ population levels (Figure 5). Circle, for example, is forecasted to face an inadequate elemen-

FIGURE 5



SOURCE: Respective city/county or regional planners.

tary school situation as a result of population growth attributable to the construction of the Redwater II tract. Additionally, Fairview, Sidney, West Glendive, and Richey would experience an inadequate level of some community services by 1986 even without tract development. A tract-related population influx in these communities would further exacerbate an inadequate service situation, however, the inadequacy of these services could not be directly tied to tract development.

Full operation of the Redwater II tract (i.e., 1991 and beyond) is not expected to directly result in impacts on communities services. None of the communities are expected to experience public services which would be inadequate as a direct result of the population influx resulting from tract operation. However, the following communities in the study area are forecasted to face inadequate public services by 1991 even without development: Savage, Circle, Lambert, Fairview, Sidney, West Glendive, Richey, and Glendive. Development of the Redwater II tract would further worsen an inadequate service situation in these communities.

The adequacy ratings appearing in Figure 5 reflect assessments by either city-county or regional planners for the communities involved and constitute the planners' best judgments concerning the fiscal (revenue/cost) situation likely to be encountered by the communities in 1986 and 1991. Several of the services appearing in the community service graphics are of greater importance than others in maintaining public health and safety. Basic services such as sewage collection and treatment, water supply and water storage/distribution, health care and police/fire protection are of more immediate concern to community well-being than are nonbasic services such as recreation facilities and libraries. Consequently, communities which experience impacts to these basic services would undergo somewhat greater difficulties than would a community which experiences impacts on its nonbasic services. Additionally, inadequacy of basic services (water and sewage systems especially) can be difficult for a community to deal with because of the relatively large capital expenditures required for upgrading these types of services.

Because of its population base, economic diversity, and lack of relative isolation, Glendive and West Glendive would be much better prepared to absorb the effects of development in the Redwater II tract than would McCone County and the city of Circle.

Circle and McCone County have no experience with development and are relatively homogenous socially. An increase of 50 percent of the baseline population would constitute a high level of growth for the community to absorb. While disruptions might typically be centered during the short-term, it is also expected that the presence of roughly 400 persons in Circle in addition to the baseline forecast during the long-term would have substantial effects on the social structure of that area.

Quality of life in McCone County would be affected noticeably by presence of an active mine in the Redwater II area. Since the social environment would be more complex than presently exists or would exist without mining, the informal, supportive, and trusting atmosphere would be adversely affected as new residents enter the area. Glendive and West Glendive, while attracting a large proportion of incoming population attached to the development, would likely absorb these persons without undue stress or change in the social environment.

It is uncertain as to whether retail firms would be attracted to Circle, based on population changes. The lack of retail opportunities, perceived by residents as a major problem of living in the area, would not be necessarily altered.

Mitigation of social and economic impacts can be accomplished through several technical and/or financial categories from both federal and state sources. These include:

1. Mountain Plains Federal Regional Council Energy Impact Office. This office has several functions designed to alleviate impacts on counties and communities, including: (a) provide information about and facilitate applications for technical and financial assistance, (b) develop and participate in workshops for state, local, federal, and industry people on impact assessment and mitigation, (c) encourage and facilitate development of local energy impact assessment task forces.

2. HUD, USGS, DOE, EPA and Department of Labor are all active in sponsoring advanced planning and mitigation assistance. However, because of federal budget cuts, it is unclear whether any federal agencies will be committed to providing technical assistance to state and local governments in energy impacted areas.

3. The Farmers Home Administration (FmHA) 601 Program provides grants to designated (approved) coal impact areas for planning, site acquisition, and development of public facilities and services in addition to housing on sites owned by a city or county. However, currently there are no Montana counties in the Fort Union Region which are designated as being eligible for FmHA 601 monies.

4. States currently receive 50 percent of the federal mineral leasing royalties. This money could be used to mitigate impacts in those areas which are impacted by federal mineral development.

5. Montana Department of Commerce (formerly the Department of Community Affairs (DCA)) provides direct technical assistance to communities in the coal resource areas of eastern Montana. This assistance includes workshops and training sessions in local planning and impact assessment, growth management and impact migitation techniques, funding sources for planning and public facilities and others.

6. The eastern Montana field office of the Department of Social and Rehabilitative Services is available to assist eastern Montana communities assess and plan for human service impacts.

7. Funding by the Montana Coal Board is available to local governments which have been required to expand the provision of public services as a consequence of large scale development of coal mines and coal-using energy complexes. These funds originate from an 8.75 percent portion of the revenues from Montana's coal severance tax.

Technical reports are available which discuss the methodology used in the economic or social analyses.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action would be localized and insignificant. The modification of surface contours and surface reflection due to redistribution of soils and removal of vegetation may produce slight localized changes in windspeed and direction, temperature, and humidity. Reclamation with reestablishment of vegetation would largely mitigate these impacts over the long term.

The methodology for determining the air quality impact of particulate emissions consisted of (1) obtaining mine profiles for each tract from the U.S. Geological Survey (USGS), (2) obtaining emission factors for individual surface coal mining operations, (3) using the mine profile and emission factors for calculations of total emissions, (4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations, and (5) comparing predicted concentrations to National and State air quality standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the peak production year.

Details about the CDMQC model, emission factors, and their application appear in a technical report available from BLM.

The results of the modeling exercise were plotted on a series of isopleth maps. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments established primary and secondary National Ambient Air Quality Standards (NAAQS). Montana also has established air quality standards. These standards are shown in Table 5. The Montana primary standard for total suspended particulate is the same as the corresponding Federal standard.

All pollutant sources must be evaluated to determine if Prevention of Significant Deterioration (PSD) regulations apply. These standards are also shown in Table 5.

During the peak production mining period, total particulate emissions from the proposed action are predicted to be 3408.0 tons per year, with best available control technology applied.

Dispersion modeling was performed to predict particulate concentrations for comparison with the National Ambient Air Quality Standards and State of Montana standards. Areas within the active mining area, such as the mine facilities, pit areas, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 6 indicate annual geometric mean average particulate concentrations that will result from implementation of the proposed action. During peak coal production, the highest annual geometric mean concentration at a location off the mine site would be 14.0 ug/m^3. With a background concentration of 42.5 ug/m^3, the highest annual geometric mean ambient concentration would be 56.5 ug/m^3. This value is less than the Montana particulate standard of 75 ug/m^3.

Montana's 24-hour standard of 200 ug/m^3 cannot be exceeded more than once a year off the mine site. Figure 7 shows predicted 24-hour maximum particulate concentrations that would result from the proposed action. The isopleths represent a composite of 24-hour levels; therefore, the values occur over the year period indicated rather than simultaneously. 24-hour maximum values with the proposed action during full coal production would be as high as 40.1 ug/m^3. With the background concentration added, ambient levels would be 87.6 ug/m^3. These levels are within the Montana 24-hour standards.

In addition to the annual and maximum particulate standard, Montana has a PSD incremental standard of 19 ug/m^3 annually and 37 ug/m^3 for a 24-hour maximum which cannot be exceeded more than one time per year. The proposed mining activity may violate the 24-hour standard at least one time per year given the worst case conditions when heavy wind conditions in the southwesterly direction occur at peak production.

Several small sources of gaseous pollutants (sulfur dioxide, ozone, and nitrogen dioxide) are associated with surface coal mining operations. These include haul trucks, front-end loaders, scrapers, and dozers. Sources also include light-duty vehicles (chiefly pickup trucks) operated in the mine and employee vehicles operated on mine access roads.

Review of the Site Specific Analysis Reports for the Powder River tracts that had similar tons per year of coal production to the Fort Union tracts indicates that gaseous emissions are not expected to violate any air quality standards.

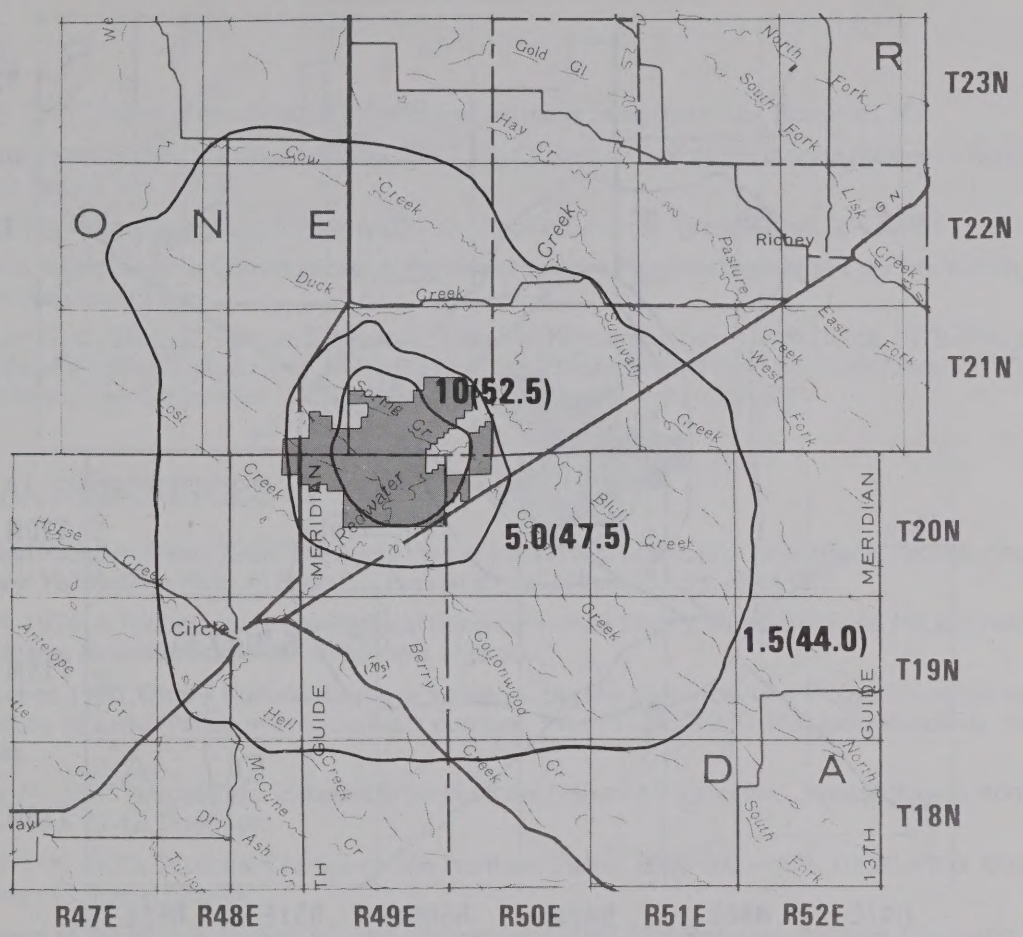
TABLE 5
Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Primary Standards ug/m³	Federal Primary Standards ppm	Montana State Standards ug/m³	Montana State Standards ppm
Sulfur Dioxide	Annual (Arithmetic)	80	0.03	60	0.02
	24-hour	365	0.14	260	0.10
	3-hour			650	0.25
Total Suspended Particulate	Annual (Geometric)	75		75	
	24-hour	260		200	
Carbon Monoxide	8-hour	10,000	9		
	1-hour	40,000	35		
Photochemical Oxidant	1-hour	240	0.12		
Nitrogen Dioxide	Annual	100	0.05		
Lead	3-month	1.5			

Prevention of Significant Deterioration (PSD) Regulations

Class II area	ug/m³
Sulfur Dioxide	
Annual Arithmetic mean	20
24-hour maximum	91
3-hour maximum	512
Particulate matter	
Annual Geometric mean	19
24-hour maximum	37

Source: National Ambient Air Quality Standards 1970; Montana State Department of Health and Environmental Sciences.

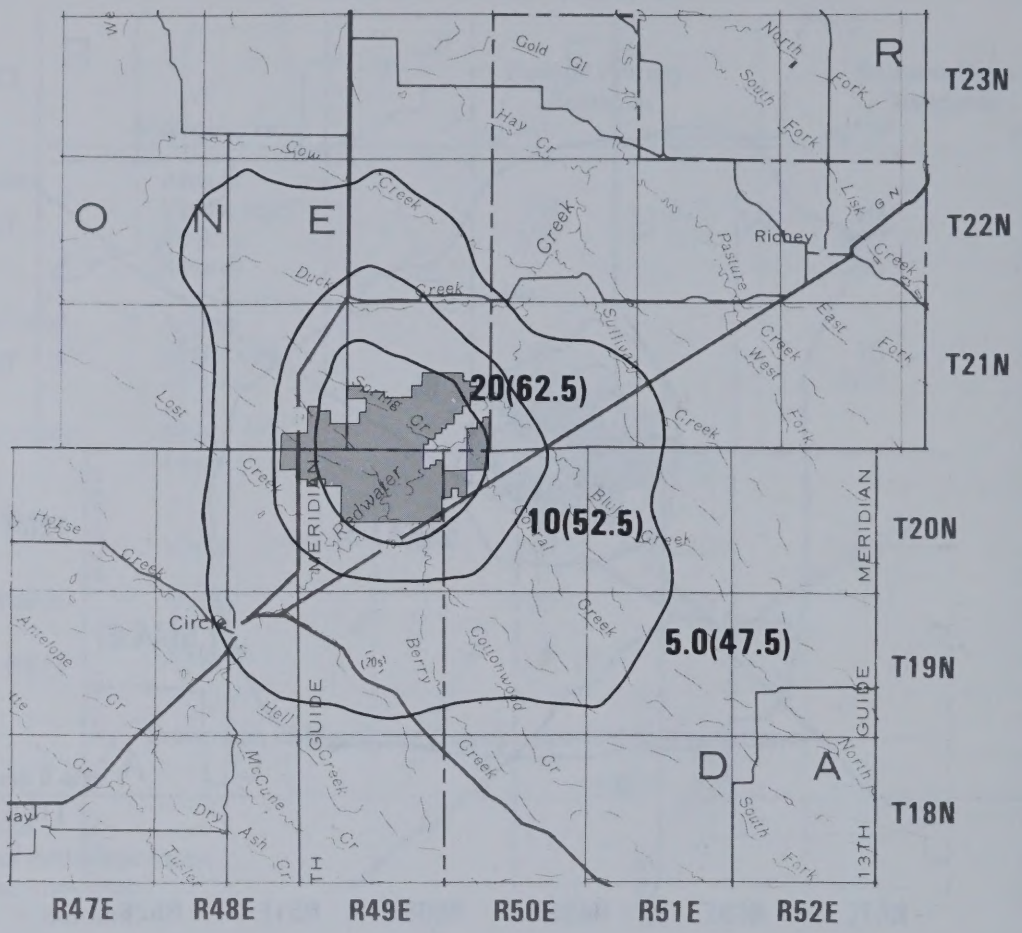


Redwater II Tract

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 6



Redwater II Tract

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 7

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SUMMARY MATRIX
REDWATER II TRACT
Resource and Environmental Considerations

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECTS OF LEASING	SIGNIFICANCE OF ANTICIPATED IMPACTS	DATA RELIABILITY	COMMENTS
Topography	Gently sloping ridges grading into relatively flat alluvial valley.	Less contrasting with original drainage patterns being reestablished.	Low	Good	
Geology and Minerals	Tract is underlain by formations that are prospectively valuable for oil and gas. There are no known wells on the tract.	None	None	Acceptable	
	Tract contains 318.7 million tons of coal.	Loss of 31.9 million tons of coal for future use by current recoverable techniques.	Low	Good	
Soils and Reclamation Potential	There are 60 soil series in the tract mapped at levels 2 and 3 in a survey done by SCS which are found along upland plains, low terraces and alluvial fans.	There will be displacement of soil by water and wind erosional forces; change in soil structure and natural fertility problems.	Significance of the impact will be high. Reconstruction potential is rated as 49% poor and suitability of soil material for reclaimability is rated as 37% fair and 14%unsuitable.	Data reliability is 90%. McCone County Soil Survey.	
Hydrology					
Surface Water Quantity	Redwater II Tract is drained by the Redwater River, an intermittent stream with peak flows in response to thunderstorms and snowmelt. Annual flow is 19,965 ac. ft. at the northeastern boundary of the tract.	The Redwater River will have to be diverted if mining interferes with present channel. Possible slight effect on downstream irrigators in terms of reduced flow.	Small	Poor	
Quality	Chemical quality most of the year in Redwater River is too poor for human consumption without treatment. The water is dominantly a sodium sulfate type with dissolved solids content about 2500 mg/l. The water is used for wildlife, stock and irrigation.	Likely reduced chemical quality following mining and reclamation.	Possibly significant to present users.	Poor	
Alluvial Valley Floors And Flood Plains	The Redwater River is a possible AVF.	Change in stability of channel and floodplain if mined.	Possibly significant if channel mined.	Poor-fair	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECTS OF LEASING	SIGNIFICANCE OF ANTICIPATED IMPACTS	DATA RELIABILITY	COMMENTS
Groundwater Use in Tract	9 stock wells and 3 domestic wells exist in the tract. All tap the near-surface aquifers.	All existing wells in the tract would be destroyed and could be replaced by wells that tap deeper aquifers.	Minimal costs for mining company to redrill wells	Good	Near surface aquifers are alluvium, Tongue river, and lower Ft. Union. Fox Hills-lower Hell Creek is principal deeper aquifer.
Quantity	Alluvium yields generally range from 5 to 10 gpm. Tongue River aquifer yield from 2 to 50 gpm. Lower Ft. Union probably yields 2 to 10 gpm. All these near surface aquifers flow generally toward the Redwater River and its major tributaries. Fox Hills-Lower Hell Cr. aquifer yields up to 200 gpm with flow generally east-northeast.	Mining may have a short term effect on water levels in nearby wells which include 5 stock and 5 domestic wells. Water levels should recover within a few years following mining. Wells redrilled in deeper aquifers would probably experience higher water levels and better quality than existing wells.	Possibly significant if water levels are lowered, especially in domestic wells.	Good	Increased use of domestic water due to influx of mining personnel is expected to have no impact on present users.
Quality	Groundwater in near surface aquifers is sodium-sulfate or bicarbonate type with dissolved solids content ranging from 1000 to 4000 mg/l. Deeper aquifer water has dissolved solids content around 1000 mg/l with sodium and bicarbonate as the dominant ions.	Mining and reclamation could lower chemical quality of water in Tongue River aquifer as well as its discharge area, the Redwater River.	Possibly significant to domestic wells downgradient.	Fair	
Vegetation: Prairie County Grassland with influences from the Northeast Grassland (Payne, 1973)	Native veg. covers 61% or 12,415 acres of the tract. Primary land use is by livestock with some large cropland areas. Vegetation provides food and habitat for wildlife, retards erosion, and improves air and water quality.	Vegetative Subtypes to be disturbed: Grassland 7772 Big Sagebrush 2555 Silver Sagegrush 156 Badlands 1392 Total Acres 12,415	High due to long term elimination of established plant communities and reduction of species diversity. Reservoirs and shallow underground waters will be highly impacted by surface mining.	Data reliability is 95% from McCone County ASCS Committee. Reliability determined by cross-checking data received. There is no data at present that lists kinds/numbers of wildlife dependent on vegetation in tract.	Many native plant species may be lost through mining. Impacts may be lessened by immediately respreading top soil. Impacts will extend past the 30-year life of the mine.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECTS OF LEASING	SIGNIFICANCE OF ANTICIPATED IMPACTS	DATA RELIABILITY	COMMENTS
Livestock Forage in Animal Unit Months (AUMs) (McCone County Average)	Average Production is 3,439 AUMs.	Average annual loss of 86 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 3,104 to 4,718 acres and 860 to 1,307 AUMs.	Moderate to high depending upon individual operation. Low to moderate for overall tract.	Grazing data from McCone County Conservation Districts Long Range Program Circa 1976.	If the rangelands were in excellent condition, the total loss projections due to mining would be 41,218 AUMs.
Threatened or Endangered Plants	There are no reports of threatened or endangered plants in the mining area	Low	Low	Good	No plants in MT have been accepted as yet by the FWS for inclusion on the threatened or endangered plants list.
Noxious Weeds	There are six noxious weeds identified in the Circle Planning Unit. Only Canada thistle and Field Bindweed have been reported on or near the tract. The other plants are: 1. Russian knapweed 2. Leafy spurge 3. Whitetop 4. Snowy milkweed	Low to moderate	Low to moderate	Data obtained from Circle Planning Unit documents, developed in 1978.	The impact depends on whether mining operations disturb noxious weeds before or after seed has been produced, and how topsoils containing noxious plant roots are handled.
Agriculture	There are 7,806 acres of land in the tract that are currently being cropped. The irrigated lands are found adjacent to the bottomlands.	Average annual loss of 106 acres excluding 3,279 total acres of summer fallow. Annual production on this 106 acres would be 3,010 bu. of wheat. Maximum loss in any one peak mining year would be 1,067 to 1,622 acres and 30,303 to 46,065 bu. of wheat.	Moderate to high depending upon individual operation. Low to moderate for overall tract production.	Data reliabilty is 95% from the Dawson and McCone Counties Ag. Stabilization Conservation Committees. Reliability of data determined by cross-checking data received.	
Land Use	No industrial activites. Some farming. Ranching is primary use.	Introduction of industrial activities. Land required for mine facilities, roads, pipelines and powerlines. A 300-foot buffer zone required on 5 residential homes, commercial and public structures. Relocation or 100-foot buffer zone required on transmission lines and public roads/ highways.	Moderate during mining. Low to none after reclamation.	Good	Existence of mining activities may encourage further development of area.
Recreation	Only known recreation activity is hunting. Access into area is by dirt road. Surface property under private control.	No real impacts on-site. Displacement of seasonal hunters during mining. Off-site: Additional families in area will add pressure on facilities in region. Water draw may impact Fort Peck Reservoir.	Slight		

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECTS OF LEASING	SIGNIFICANCE OF ANTICIPATED IMPACTS	DATA RELIABILITY	COMMENTS
Wildlife	See Range Section for habitat acreages.				
Fisheries	Redwater River is popular fishing area for nearby residents, mostly walleye and northern pike. Lower section valuable for spawning. May be declared unsuitable as alluvial valley floor.	Fishing, including spawning area, probably destroyed during mining. Adequate reclamation questionable.	Fishing recreation reduced significantly for local residents.	Good	Could be reclaimed to waterfowl and fishing area, making it a significant year-round recreation resource.
All other wildlife	Unknown until studies completed.	Insignificant with present data, may change when studies completed.	Insignificant with present data, may change when studies completed.	Studies not complete.	
General					Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled it would significantly reduce recreation opportunities.
Cultural/ Historical Values	Tract not inventoried to date. BLM-sponsored inventory scheduled for 1981. Expected prehistoric resources include lithic scatters (70-80%), stone circles (10-20%), ceramic bearing sites, rock-shelters, kill sites (10% combined). Expected historic resources include homestead and ranch remains (50%), historic rock art (20%), freight roads, dugouts, cairns, trading posts, burials & battle sites (30% combined).	Direct impact to all cultural resources in the tract through damage and destruction and increased erosion, access and vandalism.	Damage and destruction to sites, artifacts, their immediate environmental context and the data these contain.	Good to Excellent	Expected resources in tract have been extrapolated from the literature on reported sites in the Fort Union KRCRA's and inventory surrounding the Fort Union region BLM unpublished, Davis, 1976; Greiser, 1980; Johnson, 1977; Reeves, 1970).

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECTS OF LEASING	SIGNIFICANCE OF ANTICIPATED IMPACTS	DATA RELIABILITY	COMMENTS
Wilderness	N/A	None	None	N/A	N/A
Visual Resource Management	Mostly flat terrain with dryland farming and some grazing. Redwater River meanders through tract. Man-made intrusions exist in area.	Disturbance of 20,600 acres, plus the facilities and equipment associated with operation. Addition of on-site generation plant. Utility corridors for power and water.	High	VRM contrast rating.	
Climate and Air Quality	Excellent	Minimal background addition. All standards will be met except 24-hour PSD standard for TSP may be violated at least one time per year under certain conditions.	May be significant	Fair	

Economics and Social Conditions

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECTS OF LEASING	SIGNIFICANCE OF ANTICIPATED IMPACTS	DATA RELIABILITY	COMMENTS
Population/ Employment	Population/ Employment numbers appear in a stable or small increasing trend.	Increases in: Glendive Circle Savage Lambert	Population/ Employement increases are high/ moderate in Circle, moderate in Glendive, Low in Savage and Lambert.	Good	See population and employment graphics in Chapter 3 for more detail.
Regional Personal Income	Regional personal income forecasted to increase moderately through the year 2000.	Slight increase in regional income from tract construction and operation.	Insignificant	Fair	
Infra-structure	Most services are adequate or barely adequate in Glendive, Savage, Lambert, and Circle.	These communities would have 1 or 2 services which would become inadequate as a direct result of tract development.	Glendive - Moderate/high impact for water supply. Savage - Moderate/ high impact for public/health/ ambulance. Moderate/low impact for social services. Lambert - Moderate/ high impact for public/health/ ambulance. Moderate/low impact for social services. Circle - Moderate/low impact for elementary school.	Excellent	See community service graphics in Chapter 3 for greater detail.
Resident Perception of Community Services	Problem Areas: Dawson County a) medical b) recreation/ entertainment McCone County a) roads b) recreation	Not Applicable	Not Applicable	Dawson - Good McCone - Good	
Social Attitudes	Respondents in both Dawson and McCone supported coal development although support was somewhat lower in McCone than Dawson County.	Not Applicable	Not Applicable	Dawson - Good McCone - Good	
Quality of Life	Major asset cited was the peaceful, quiet, friendly atmosphere.	Some slight deterioration in quality of life is expected.	Insignificant	Dawson - Good McCone - Good	

REDWATER II TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	Applied	N/A	N/A	No federal land systems found within the tract.
2. Rights-of-way and easements	Applied	None	None	Applied to Federal surface and/or private surface over federal coal.
3. Buffer Zones	Pending	N/A	Yes	Requires agreements w/local governments and private owners of dwellings.
4. Wilderness study areas	Applied	N/A	N/A	No wilderness study areas found within tract.
5. Scenic areas	Applied	N/A	N/A	No scenic areas found within tract.
6. Land used for scientific studies	Applied	N/A	N/A	No lands used for scientific study were found within the tract.
7. Cultural and historical sites	Pending further study	N/A	Yes	Applied upon completion of inventories (Dec., '81)
8. Natural areas	Applied	None	None	No designated natural areas within the tract.
9. Federally listed endangered species	Pending further study	N/A	Yes	To be applied in Dec. '81.
10. State listed endangered species	Pending further study	N/A	Yes	To be applied in Dec. '81.
11. Eagle nests	Pending further study	N/A	Yes	To be applied in Dec. '81.
12. Eagle roosts and concentration areas	Pending further study	N/A	Yes	To be applied in Dec. '81
13. Falcon cliff-nesting sites	Pending further study	N/A	Yes	To be applied in Dec. '81
14. Migratory birds	Pending further study	N/A	Yes	To be applied in Dec. '81

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
15. State resident fish and wildlife	Pending further study	N/A	Yes	To be applied in Dec. '81
16. Flood plains	Applied	None	None	No significant flood plains were found within the tract.
17. Municipal watersheds	Applied	None	None	No municipal watersheds were found within the tract.
18. National resource waters	Applied	None	None	No national resource waters were found within the tract.
19. Alluvial valley floors	Pending further study and determination	Not at this time	Yes - awaiting determination from OSM	Finalized prior to lease.
20. State proposed criteria	Applied	None	None	No State criteria.

PRELIMINARY FACILITY EVALUATION REPORT

PRELIMINARY

FACILITY

EVALUATION

REPORT

PRELIMINARY FACILITY EVALUATION REPORT

GOALS AND OBJECTIVES

The Fort Union Regional Coal Team, in its consideration of leasing federal coal, will address the likely coal end-uses and their implications. The purpose of evaluating how the coal will be used is to present the most probable major impacts of development.

The end-use facility evaluations are at a reconnaissance level and the reports are presented only as general approximations of facility characteristics and impacts.

The uncertainty of actual end-use facilities and the inherent problems in defining a "typical facility" limit end-use analysis to broad generalizations. The evaluations are not meant in any way to substitute for detailed site specific evaluations, EISs, or analyses which come later when mining and facility projects are actually proposed. The end-use facility evaluations will not preclude any federal, state, local, or private decisions concerning actual end uses, facility siting, or end-use restrictions. The end-use reports are meant only to provide additional information to be used in decisions concerning the leasing of federal coal in the Fort Union Region and should not prejudice any later decisions.

End-use evaluations, referred to as preliminary facility evaluation reports, have been prepared for those tracts for which a new coal-use facility is expected to be built. One of the three proposed end-use facilities has been assigned to those tracts based on expressions of interest, tract size, or existing facilities. The typical facilities to be considered are: a 250 million standard cubic feet per day gasification plant; a 1,000 megawatt electric power generation plant; and an 85,000 barrel per day indirect coal liquefaction plant.

Part I of the report summarizes what the assigned typical end-use facility might be like. The description of the facility gives plant size, process technology, plant requirements (fuel, land, water, power), emissions, and other characteristics of facilities likely to be proposed in the Fort Union Region. The description includes ancillary facilities and a discussion of construction and operational aspects of the facility that are relevant to determining impacts that could occur in the vicinity of the tract.

The facility description is based on existing analyses, studies, environmental impact statements, and consultation with State and industry representatives. Part II of the facility report is an analysis of the facility impacts on the tract area.

The preliminary facility evaluation reports will be used by the Regional Coal Team to rank federal coal tracts with a better understanding of likely future development impacts and implications.

PART I

Assumptions and Variables

The typical electric power facility characteristics are based on numerous assumptions and reasonable values for important variables. Some of the assumptions and variables are based on best estimates. Others are based on existing literature, facilities, and on input from industry sources.

Facility Location, Type, and Size

Because of the economics of lignite coal, it was assumed in the early stages of the Fort Union coal leasing process that the end-use facilities would be near the tracts to be leased. The energy value of lignite coal as well as the water content make the transporting of lignite for long distances uneconomical. For purposes of issue level impact analysis, the electric power facility assigned to the Redwater II is not specifically located but assumed to be near the tract. Such an assumption will eliminate the problems of arbitrarily siting facilities. Facilities were sited, however, for the air quality modeling. Where specific site location information was available from potential project developers, it was used in the facility analysis.

The proposed electric power facility will produce 1000 megawatts (gross) of power. The coal-fired electric power plants being constructed or planned in the region generally have from one to three generation units, each producing from 400 to 500 megawatts of power. A facility consisting of two 500 MW units was chosen to be representative of a typical electric power facility.

Construction Period

The construction time span for an electric power or synfuel facility can vary greatly. A company hiring four to five thousand construction workers could complete the proposed facility in as short a time span as three years. A company could choose to lengthen the construction period or build parts of the plant capacity in two or more construction phases. This would reduce the construction work force and spread construction over as many as ten years.

The assumption is that the facility will be constructed in phases. For the two unit electric power plant, the second unit would begin construction in the third year after the first unit is begun. The total construction period would cover approximately eight years.

Employment

The construction work force will be a function primarily of the construction schedule. Work force numbers were supplied by the Basin Electric Power Cooperative. The average yearly employment figures are based on the projected work force for the Antelope Valley Power Plant.

Water Requirements

Water demands for an electric power facility depend on production technology, plant load factor (percent of output capacity), operation time, and water quality. The values used for water requirements are based on estimates from Basin Electric. The value for gallons per minute is an estimate of average water use for the facility. The yearly requirements are an approximation based on an operation factor assumed for the facility. This operation factor indicates the time the facility will be in operation each year. The electric power facility will assume an average load factor since peak power will not be needed full time due to varying load demand.

For analysis purposes, water for the electric power is assumed to come from the Fort Peck Reservoir.

Emissions

The air emissions for the electric power plant will depend primarily on the facility's production process, the amount and quality of coal burned, the level of pollution control.

An assumption affecting air emissions from a generic facility is the quality of the coal. The sulfur, ash, and water content of the lignite will not only influence emissions per ton of coal burned, but will also determine the amount of coal required for a given facility. The air emissions from any type of coal conversion facility will be a function of the conversion process characteristics and the emission control technology used at the facility and the level of control used.

The impacts resulting from air contaminants emitted by the coal end-use facility are deduced by using established air quality standards above which deleterious effects of the contaminants are implied to occur. A facility's ability to meet air quality standards assumes there would be no significant deleterious effects to human health, animals or vegetation. Such an assumption is the subject of continuing discussion and is disputed by certain research studies. A more detailed discussion of this issue can be found on pages 37-94 in the Final West-Central North Dakota Regional Environmental Impact Study on Energy Development (October 1978). The facilities could also emit certain pollutants for which there are no standards. The anticipated levels of air quality concentrations of contaminants are obtained by measuring existing levels of air quality and adding computer simulation of the atmosphere loading resulting from the end use facility.

The air quality impacts are considered in terms of ambient air standards and prevention of significant deterioration standards. Under authority of the Clean Air Act of 1970, the State of Montana has promulgated its own ambient air quality standards. The purpose of the Montana Ambient Air Quality Standards is to control the quality of the air over Montana such that a) the health of sensitive and susceptible segments of the population will not be adversely affected; b) concentration of pollutants will not cause public nuisance or annoyances; c) significant damage to animals, ornamental plants, forest and agricultural crops will not occur; d) visibility will not be significantly reduced; e) metals or other materials will not be significantly corroded or damaged; f) fabrics will not be soiled, deteriorated, or have their colors affected; and g) natural scenery will not be obscured. Montana's ambient air standards are generally more stringent than the federal EPA standards, and they include a number of criteria for which there are no EPA standards, such as visibility (Class I areas only), hydrogen sulfide, and fluoride.

Under authority of the Clean Air Act Amendments of 1977, Prevention of Significant Deterioration (PSD) standards apply to all areas that are in compliance with federal standards for particulate matter and sulfur dioxide. PSD establishes three air quality classes. Class I areas allow only a small incremental increase in pollution beyond existing conditions in the area at the time of designation. The bulk of the United States was designated Class II, which allows for well-planned growth and some additional pollution, although within limits that are well below the standards. Class III applies to areas of industrial growth and permits incremental increases in pollution up to, but not exceeding, the standards. Since 1974, Congress, the states and Indian tribes have been eligible to petition EPA to classify areas Class I and Class III, providing that various specified procedures are followed. Wilderness and certain other specially managed areas in existence before August 1977 received automatic Class I designations, and the Northern Cheyenne Tribe requested and received Class I status for its reservation in mid-1977.

The federal Clean Air Act states that pollutants originating in Canada are to be included in calculating the existing air quality of neighboring regions of the United States for purposes of enforcing the PSD standards, unless the governor of a state takes action to exclude such pollutants.

After March 1979, the states were to be responsible for administering the PSD regulations and for processing redesignation petitions. However, due to changes in the federal rules, PSD delegation for Montana has not yet been approved. The Air Quality Bureau is presently evaluating procedural alternatives for PSD administration.

An in-depth analysis of air quality impacts resulting from facilities associated with certain coal lease tracts was impossible. Discussion of site specific impacts without addressing the interactive and cumulative impacts would have little decision value. For the purpose of this analysis, the end use facility which has been assigned to the coal lease tract will be discussed. This discussion will contain general statements regarding facility impacts on the air quality. The impact analysis is based on standard dispersion computer modeling using the worse case situation. The anlysis is in terms of compliance or noncompliance with ambient air quality standards or PSD standards. A limited analysis of this type cannot be substituted for a detailed permit review. Care must be taken to use this information with the proper qualifiers and should not be taken out of context.

Solid Wastes

Estimates of solid wastes from the facility are based on figures from Basin Electric. Estimates for ash and sludge could vary considerably depending on the ash content of the coal and the pollution control technology used. Planned facilities are proposing to dispose of solid wastes in the nearby mines.

ELECTRIC POWER FACILITY

Introduction

A typical coal fired steam electric power generation plant will consist of two 500 megawatt (gross) units located near a lignite coal source. The facility with an average operation factor of .90 and a load factor of .85, will be capable of delivering a maximum of approximately 900 MW to the existing transmission system. The facilities for the electric power complex would consist of the following major areas: 1) coal preparation, 2) power generation, 3) pollution control and waste disposal, and 4) pipeline and transmission facilities. See Figure 1.

The total land area dedicated to the electric power generation facility would be approximately 600 acres. The main building at the facility site will house the boiler and turbine units. Other structures at the site will include facilities for coal handling, cooling water, air pollution control, and administration.

Employment

The construction of two electric power generation units is expected to last approximately eight years. The average annual number of workers required for plant construction will peak in the third year of construction when substantial work on both units would be underway. The peak construction work force is expected to be approximately 1,900 workers in the second quarter of the third year. Once in operation, the facility will permanently employ about 200 people.

TABLE 1
AVERAGE YEARLY EMPLOYMENT

Year	1	2	3	4
Construction	309	1138	1248	798
Permanent				36

5	6	7	8	
666	580	682	168	
102	108	108	200	etc.

Source: Basin Electric Power Cooperative for Antelope Valley Station.

Coal Preparation, Storage, and Handling

Lignite coal would be transported from a nearby mine to a three day live storage pile or a sixty day dead storage pile. From the live storage pile, the coal would be sent by conveyor to be crushed before being transferred to the plant silos for intermediate storage. Finally, coal would be conditioned before being introduced into the furnace for ignition. A typical plant would burn an average of approximately 800 tons of coal per hour or about 5.5 million tons per year. See Figure 2.

Power Generation

In a coal fired electric power plant, the crushed coal is combined with air supplied by forced-draft fans and then ignited and burned in the boiler furnaces. The combustion in the boiler furnace produces heat which creates steam from feed water entering the boiler heat exchange system. After releasing energy through expansion in the high pressure section of the turbine, steam is returned to the boiler for reheating. After being reheated, steam is returned to the intermediate section and subsequently to the low pressure section of the turbine. Spent steam passes through the condenser where waste heat is removed, and the condensed liquid is returned to the boiler feed water system. Combustion gases from the furnace are exhausted to the atmosphere through the pollution control devices. Steam energy is converted to mechanical energy by the turbine and subsequently transformed into electrical energy by the generator. Generated power is routed through the main transformer for voltage step-up and then to a switchyard and transmission line system for distribution.

Water System

The water for the power plant systems would come from a nearby river or impounded water source. Raw water would be processed to reduce hardness and alkalinity. The treated water would then be stored for use. Demineralization of the filtered water for boiler

Figure 1

TYPICAL ELECTRIC POWER FACILITY

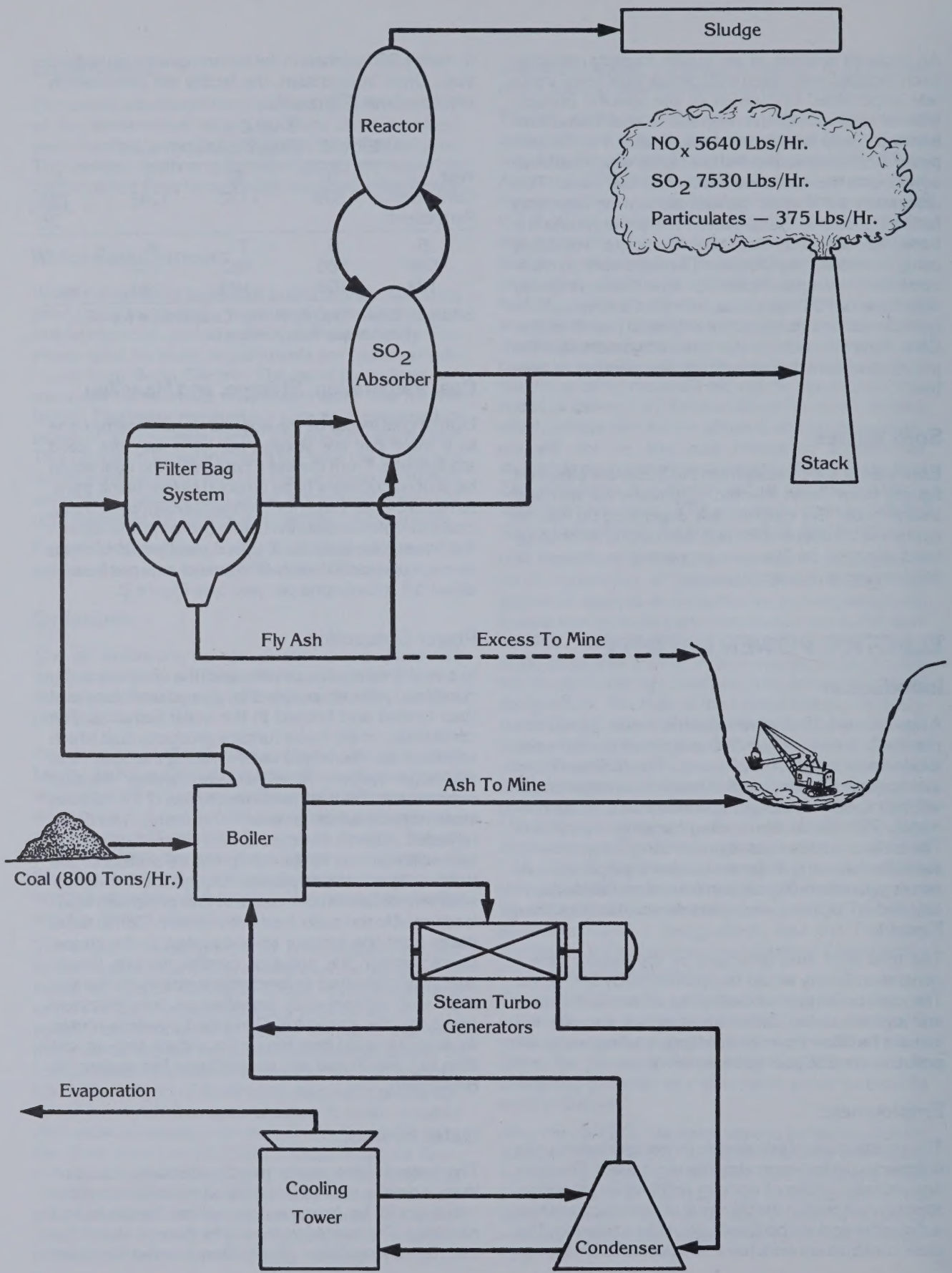
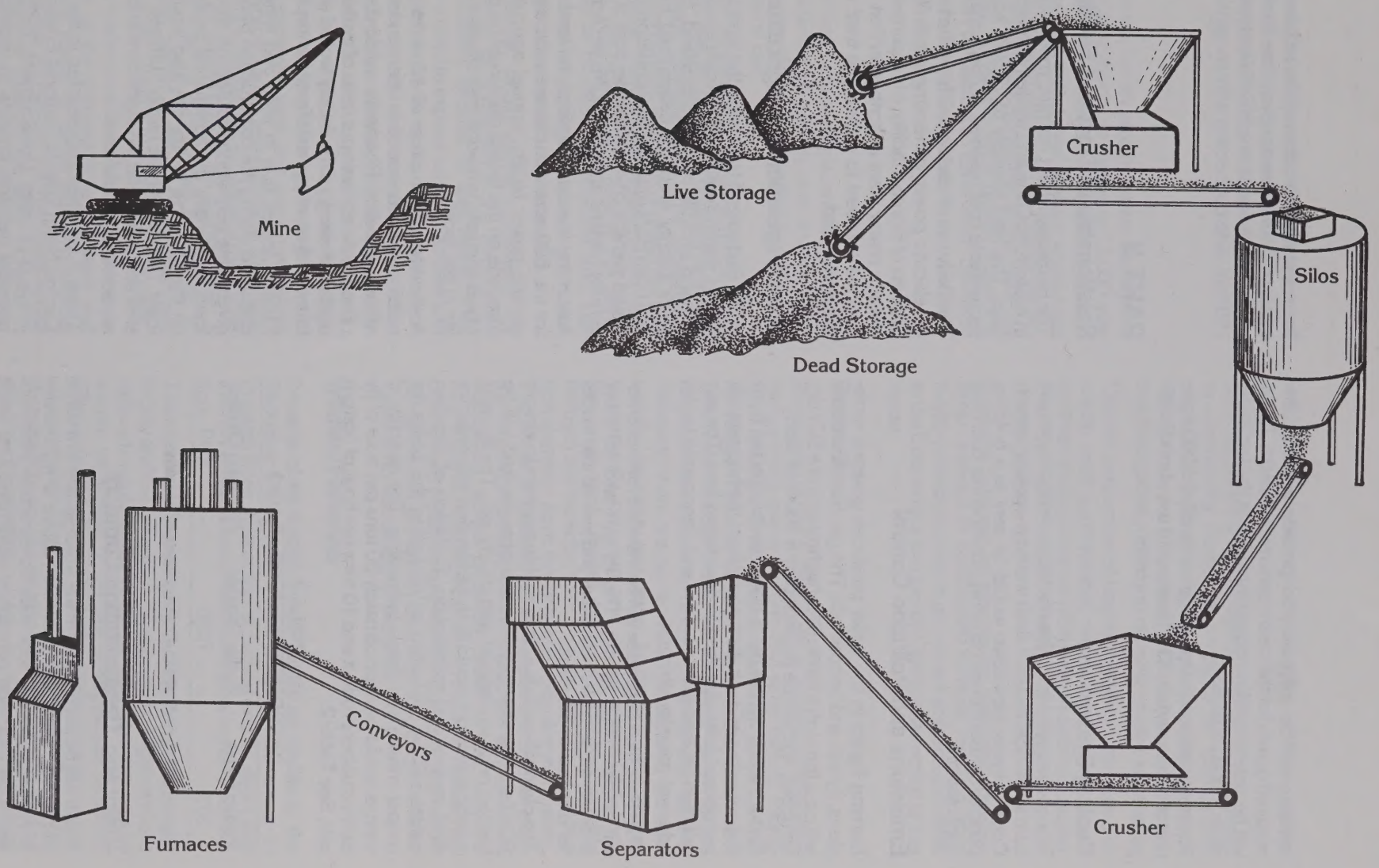


Figure 2

COAL HANDLING SYSTEM



makeup will be necessary to provide water of the required quality for the steam generation system. There will be several holding ponds included at the facility to store recoverable water.

The power plant will require approximately 13,000 acre-feet of water annually. The plant would use about 9,000 gallons per minute when in operation.

Cooling System

The cooling system for the electric power facility would be mechanical induced draft wet-type cooling towers. Cooling tower blowdown would be sent to a holding pond to be used for ash sluicing, scrubbers or coal dust suppression.

Emissions and Pollution Control

Burning lignite in the boiler produces gaseous emissions, fly ash and bottom ash. The gas from the boiler will pass through a fabric filter baghouse and a SO_2 dry scrubber, and will be dispersed by a 600-foot stack.

Bottom ash from the main boiler, pyrite rejected from the pulverizer and ash discharged from the hoppers will be hydraulically conveyed to dewatering bins. The ash will then be loaded into trucks and transported to the adjacent mine for disposal.

The fabric filter baghouse will be installed for the removal of particulate fly ash. The fly ash and scrubber product will be mixed with water and loaded into trucks for disposal in the mine.

The plant will include a dry scrubbing system to absorb SO_2 from the flue gas. The scrubber product will be treated prior to disposal with dry fly ash. The fly ash/scrubber product would likely be blended with water for dust control and stabilization. Emission of nitrogen oxides will be controlled by designing the boiler for proper mixing and flame quenching. The quantity of wastes would be approximately 80 tons per hour of fly ash/scrubber product and 10 tons per hour of bottom ash. See Table 2.

TABLE 2
GASEOUS EMISSIONS (lbs/hr)

Particulates	Sulfur Dioxide	Nitrogen Oxides
375	7530	5640

Source: North Dakota Department of Health.

Utility and Transportation Corridors

Water will be pumped from the water source to a surge pond. The water pipelines will require a right-of-way consisting of a 100 foot wide construction easement and a 50 foot wide permanent easement. The surge pond would have a water surface area of approximately 42 acres and would contain 1,050 acre feet of water.

Transportation corridors will be required for roads and a railspur. The transmission line leaving an electric power facility would be a 500 KV line with a right-of-way 150 feet wide connecting with an existing system.

PART II

Relationship of Tract and Facility

The Redwater II tract lies nine miles northeast of Circle in eastern McCone and western Dawson County, Montana. The tract consists of 20,246 acres of land with recoverable coal reserves of 286.8 million tons.

The likely use of coal mined from the tract would be for an electric power generating plant. To consider the impacts of this coal facility, it is assumed that the typical electric power plant described in Part I would be constructed adjacent to or near the tract with no specific site designated.

Soils, Vegetation and Agriculture

In the Redwater II tract area, the agricultural land consists of approximately 39 percent cropland, 3 per cent hayland and 58 percent rangeland. Based on 1978-1979 county averages determined from ASCS data and from BLM grazing files annual production per acre would average 28.4 bushels per acre of wheat, 1 ton per acre for hayland and .277 AUMs per acre for rangeland.

Assuming the same agricultural land use distribution for the 600 acre disturbance estimated for a generic electric power facility, annual agriculture production foregone on the facility site would be 8,520 bushels of wheat annually, in a worst case situation analysis, for the life of the facility.

A short-term disruption of 12 acres per mile would result during construction of an undetermined length of water pipeline. Roadways would disturb 14.5 acres per mile. A railroad spur, also of undetermined length until final siting of the facility would eliminate agriculture on 18 acres per mile for the entire life of the facility.

Erosion losses due to wind and water from ground disturbed during the construction phase of the facility, given State permitting stipulations, would not be significant. Regionally, the agricultural production foregone on the 600 acre facility site also would not be significant. Because of the highly-buffered soils in the tract area and downwind, no significant impacts to soils are expected from acid rains.

There is evidence documented in the literature (West-Central North Dakota Regional Environmental Impact Study on Energy Development, 1978) that there are potential negative impacts to vegetation and to livestock downwind from such a facility due to nitrogen oxides, sulfur dioxide and particulate matter. Such neg-

ative impacts would be analyzed in detail at such a time as more specific information becomes available in conjunction with facility permit application with the State permitting authority.

Water

Water requirements for an electric power facility are approximately 9000 gallons per minute or 13,000 acre feet per year. The likely source of water for industrial use is Fort Peck Reservoir. Withdrawal of water would have no significant impact upon the reservoir. Facility wastes of ash, sludge and water disposed of in the mine do have the potential to degrade water quality if they are disposed of within the saturated zone which develops upon reclamation. Present regulations require state approval of disposal sites.

Land Use

Changes in land use include displacement of existing use, increased intensity of existing uses and the introduction of new uses. The site of the facility is likely to displace agricultural use.

The optimum site conditions for facilities are the same as for agriculture, that is: gentle topography and soils with good drainage characteristics. The increase in population of communities results in demand for new housing, additional commercial development and expanded public use facilities. The area of this development will likely be on off-site agricultural land. The on-site displacement of agricultural land use is discussed in the Agriculture section of this report.

Increased population would create a demand for community services as addressed in the Economics and Social Conditions section of this report. This demand implies a need to expand existing facilities and commercial establishments or to create new ones. Existing commercial establishments may suffer through the construction of new facilities outside the downtown areas. Public services would be stretched in the short-term by lack of capital to implement change due to increased population. Parking shortages, traffic congestion and excessive wear and tear on roadways would make downtown areas less habitable. Municipal organizational structures and physical space may prove inadequate with increased population. For example: a part time mayor may be overworked, processing of permits may delay private building construction and filing space for public records may prove inadequate.

With the influx of workers and their families, a change in the composition of the community is inevitable and demands for new forms of public and commercial facilities for shopping, recreation, entertainment would ensue. These types of changes are likely to result in dissatisfaction by both the existing resident population and by the newcomers. Conflicts are likely to occur as a result of the contrast in the lifestyles of these populations.

Existing planning varies considerably from community to community. Some are prepared for change presaged by recent oil and gas developers in some areas, while others are ill prepared for the change in population anticipated.

Current perception of county residents with regard to roads, retail opportunities, recreational/entertainment facilities and housing are discussed in detail in Chapter 2 of the Site Specific Analysis for Economics and Social Conditions.

Similarly, forecasts by city/county planners regarding likely changes in community services resulting from facility related population growth are presented in detail in the Economics and Social Conditions section of this report.

Recreation

Recreation in the tract vicinity is limited to dispersed seasonal big game hunting and sport fishing. Pronghorn antelope is the predominant big game species harvested. There is sport fishing for walleye, northern pike and other species in the Redwater River. Access depends on landowner consent and climatic factors. Although there are no recreation facilities in the tract vicinity, existing recreation facilities in the region (community camping and picnic areas, Fort Peck Reservoir, and Charles M. Russell National Wildlife Refuge) are expected to receive the majority of recreation demand from the projected population increase. The social attitude survey revealed a concern for existing recreation facilities. It was stated that an increase in population would hopefully result in the possible upgrading of already marginal recreation facilities. This concern will be addressed with the expected recreation demand from increased population in the regional EIS. There is no wilderness in the area.

Wildlife/Fisheries

Impacts of an electric power facility on wildlife in the Redwater II tract area could occur in two areas: 1) impacts from destruction of habitat and 2) direct and indirect impacts from the increase in human population.

The removal of vegetation for a 600 acre electric power facility and the expansion of urban areas, highways, and railroads would prevent or reduce the use of an area by wildlife regardless of the type of vegetation removed. Wildlife inventories on and around the tract will not be completed until December of 1981. All significant wildlife habitat cannot be assessed until that time. Based on existing information, most of the wildlife habitat appears to be along the Redwater River which may be declared an alluvial valley floor.

If powerlines, pipelines, access and haul roads are constructed in key wildlife areas, partial or total destruction of habitat would occur depending on the magnitude of development. The worst case would destroy present wildlife populations in the area. Wildlife oriented recreation such as hunting and wildlife observation would have to be sought elsewhere. Wildlife would be impacted by eagle electrocutions on powerlines, migratory bird mortality from striking power lines close to wetlands, road kills along transportation routes through important wildlife areas, harassment of wildlife by off-road vehicle use, increased poaching, as well as habitat destruction.

Poaching and road kills have increased dramatically in areas of North Dakota, Montana, Wyoming and Colorado where energy development has occurred. The problem is compounded in areas where transportation corridors are located in important wildlife areas and shift changes coincide with wildlife feeding periods. This situation could occur in the Redwater II tract area.

The impact to wildlife could be mitigated by: 1) siting the electric power plant and associated facilities with regard for critical wildlife areas, 2) adjusting work shifts to avoid feeding times of highly visible wildlife, 3) mass transportation of employees, 4) providing funds to State fish and game agencies to better control illegal shooting of wildlife, and 5) adopting a poaching clause in union contracts.

Taking water from shallow bays in Fort Peck Reservoir could have significant adverse impacts. These areas are prime nursery and spawning areas for sport, commercial and forage fish. Taking water from deeper non-critical areas of the reservoir could reduce or eliminate the significant impacts to fisheries.

The cumulative increases in industrial, urban and other water uses will dictate the severity of the impacts on fisheries. The cumulative impact will be addressed in the regional EIS to be prepared.

Cultural Resources

The Redwater II tract area has not been inventoried to date. Information from existing inventories (BLM unpublished data, Davis 1976; Greiser 1980) outside the Fort Union coal region suggests that the predominant prehistoric sites should be lithic scatters of varying size, density and function (ca. 70-80%). Other expected prehistoric resources include stone circles (ca. 10%-20%), ceramic bearing sites, rockshelters and kill sites (ca. 10% combined). Expected historic resources include homestead and ranching remains (ca. 50%), historic grafitti and rock art (ca. 20%), freight roads, dugouts, cairns, trading pots, burials and battle sites (ca. 30% combined). Further information on cultural resource occurrence, distribution and significance cannot be quantified prior to inventory.

Visual Impacts

Eastern Montana has very high but common visual quality. In the absence of other types of visual experiences, the landscape is not highly valued as scenery because of the vast distances involved in crossing this relatively uniform area. Most highways roll with the landform so views alternate between nearby features at low points and panoramas of up to thirty miles at high points in the roadway profile. The landscape is seen in terms of these short vistas of landscape elements that will not be seen again, and short duration views of distant landscapes in which any vertical object or landscape feature serves as a focal point.

Large structural features in the Eastern Montana landscape contrast with the landscape both in terms of the visual surface (the character of what is seen) and in terms of function. Vertical and linear components of a facility, because of hard architectural edges of the structures, and the transitory nature of panoramic views imply a visual importance of these large objects for orientation. The aesthetic response is secondary to this visual function.

Neglecting cultural bias, the aesthetic response to stark architectural lines and pure planes of color contrasting with the simple curvilinear landforms of the countryside can be considered positive. This visual experience would be immediately comprehensible and would provide relief from a relatively uniform countryside. Beyond this initial response, however, are responses with origins in cultural bias and the individuals' relationships to the land. The greatest effect would be upon local residents with memories of the existing landscape to use as a comparative basis of judgment. If no attachment to the existing landscape is present, the facility would be judged more on its quality than on cultural bias.

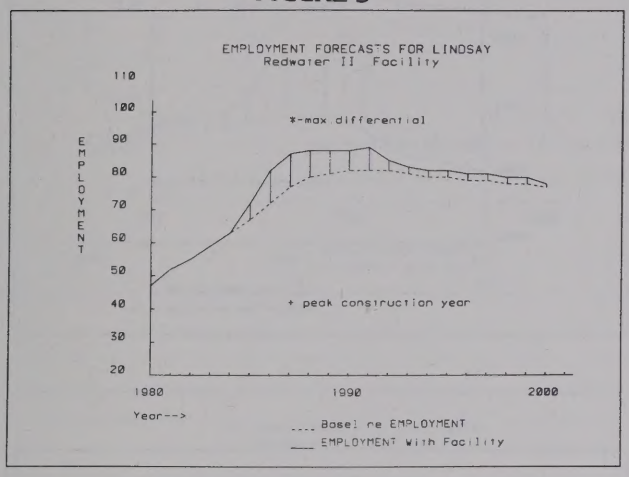
The visual impact would be the penetration of the skyline by the facility in views from communities and major transportation corridors. The 600-foot stack could potentially be seen thirty or more miles away. Powerlines originating at the site would have more extensive consequences and consideration for corridor planning related to the placement of facilities is essential to maintain visual quality in the region. The facility would be highly visible and would demand a response either positive or negative. The dominance of the facility in the landscape could be perceived as a loss of amenity through impairment of the landscape as it now exists for the forty years of the facility's expected life.

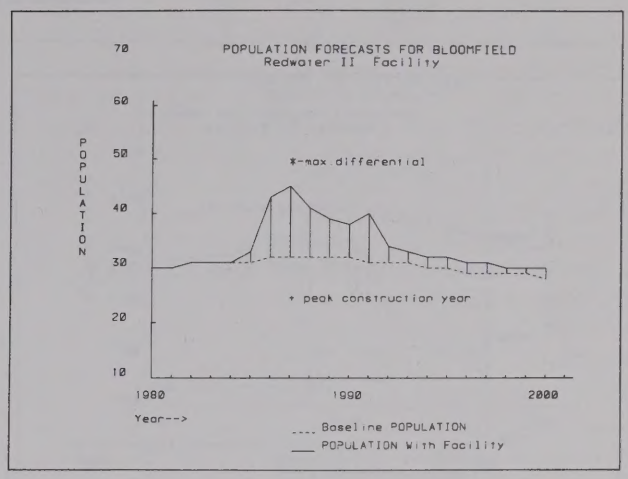
Economics and Social Conditions

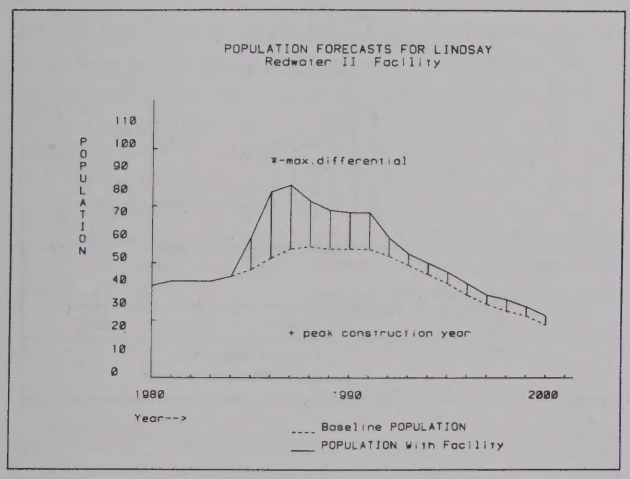
Construction and operation of the Redwater II facility would result in impacts upon services in some communities within the areas as a result of population growth associated with employment opportunities. Figure 3 shows forecasted community employment

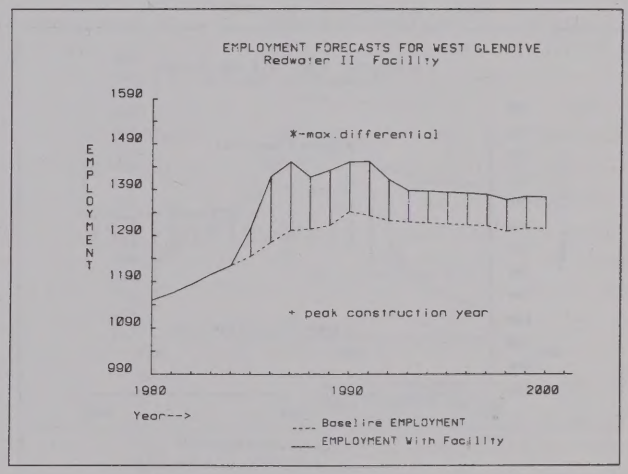
and population levels through 2000 both with and without development of the facility. As these figures show, Glendive, West Glendive, Richey, Bloomfield, Circle, Lindsay, Sidney, Lambert, and Savage would experience increases in both population and employment as a result of development.

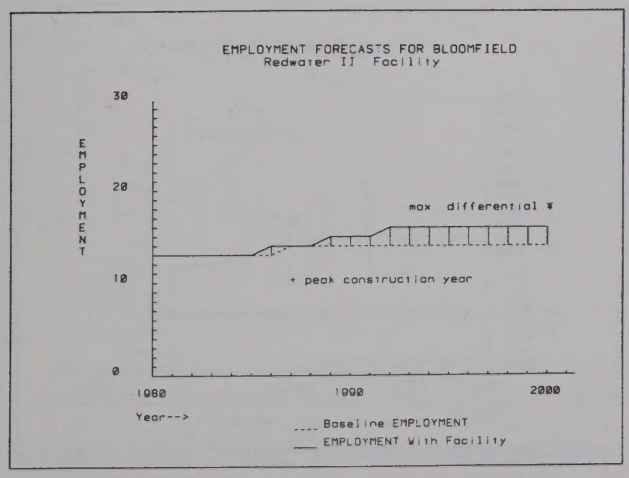
FIGURE 3











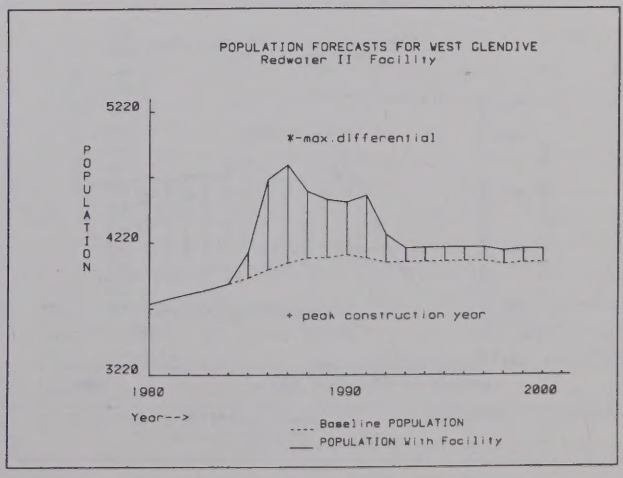
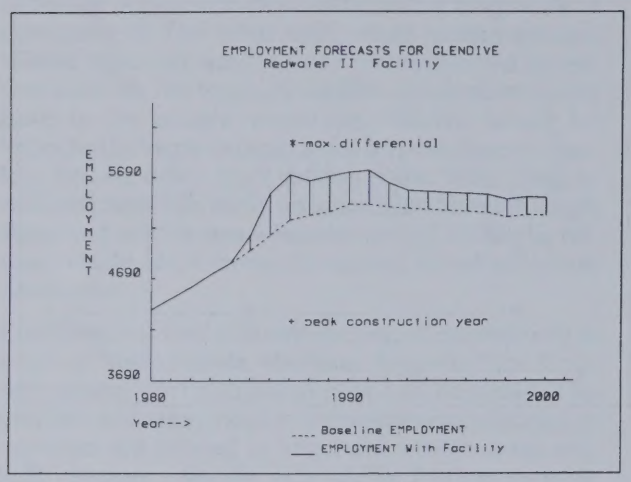
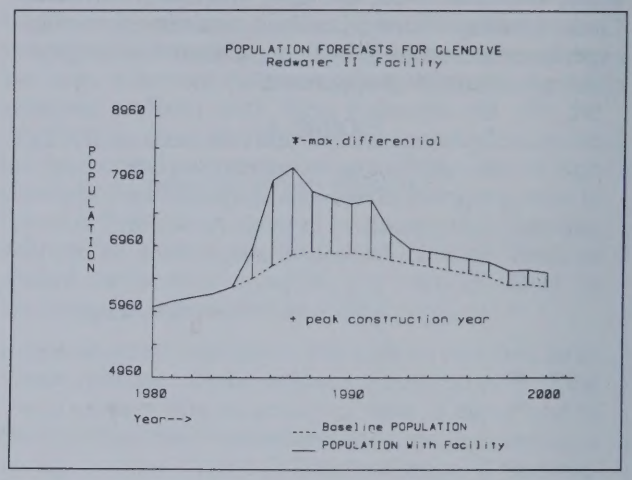
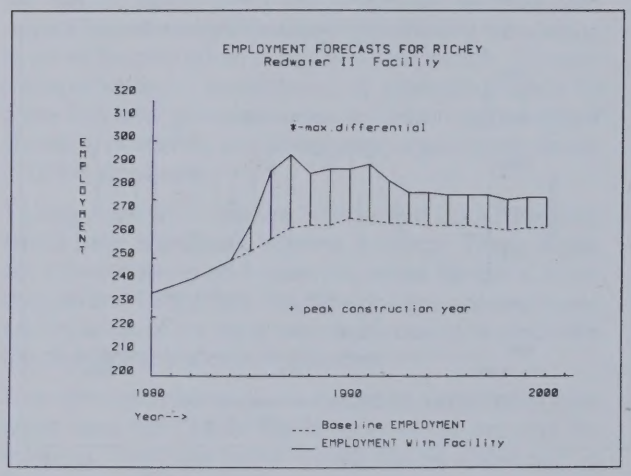
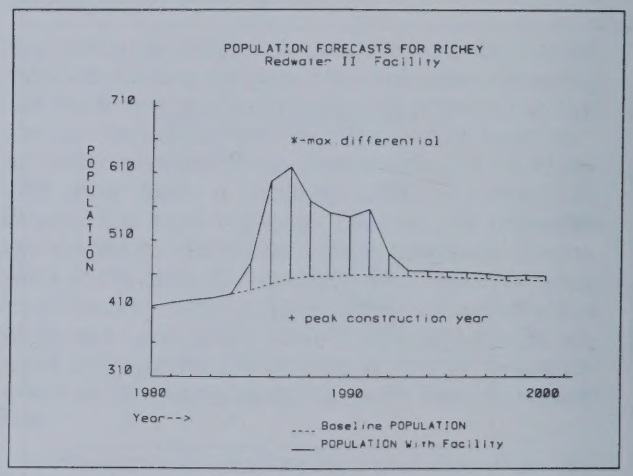


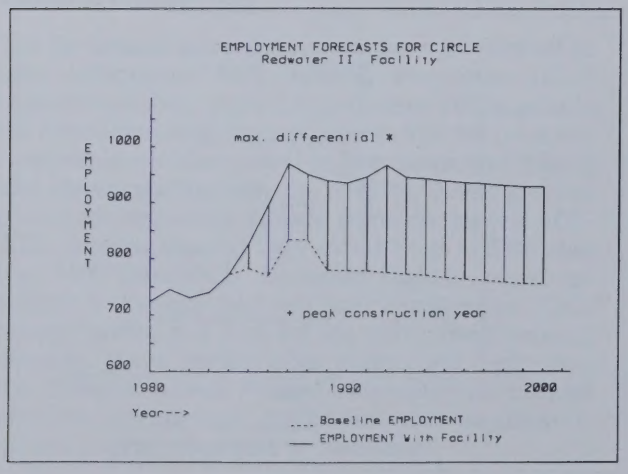
FIGURE 3 (continued)

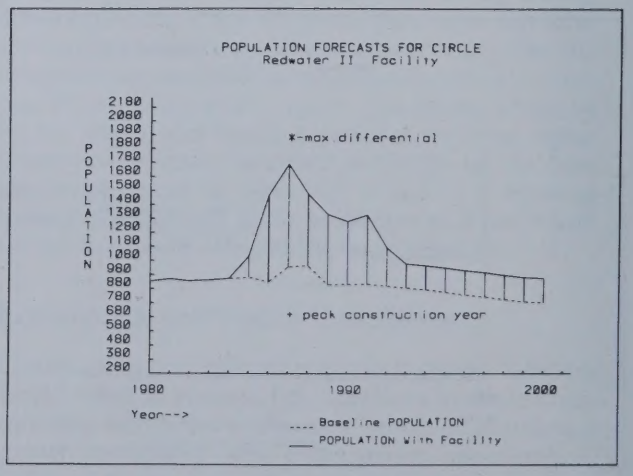












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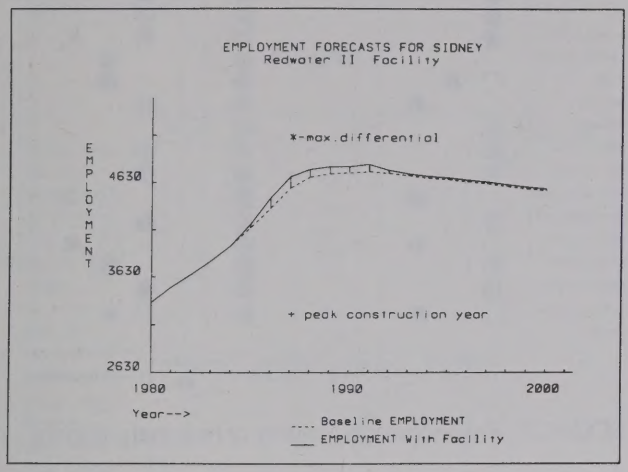
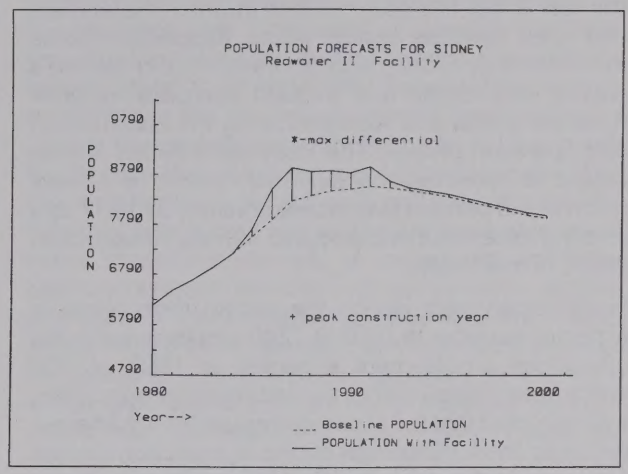
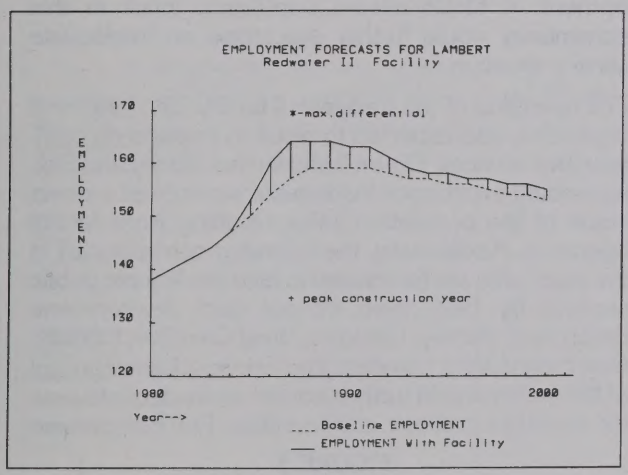
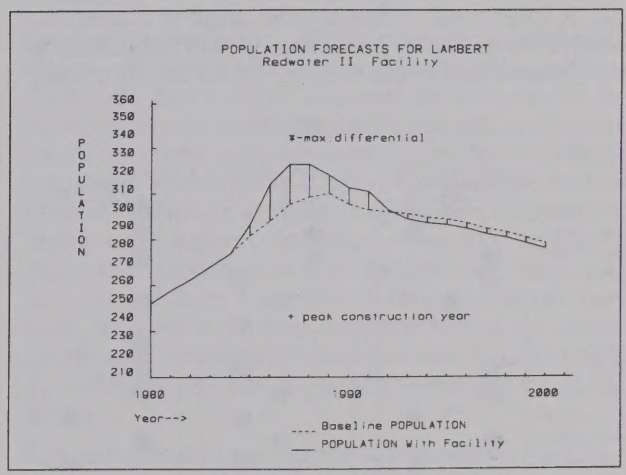
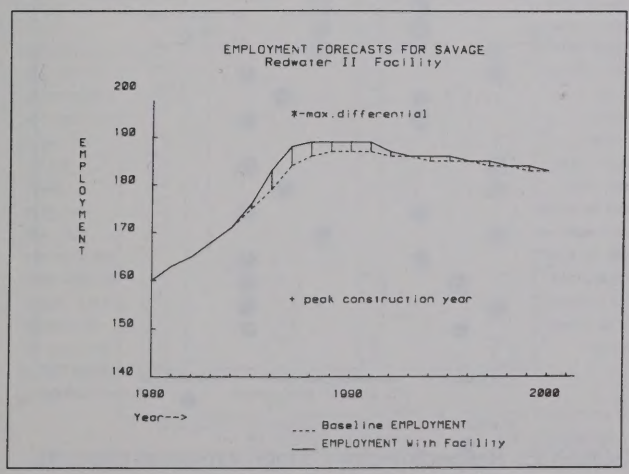
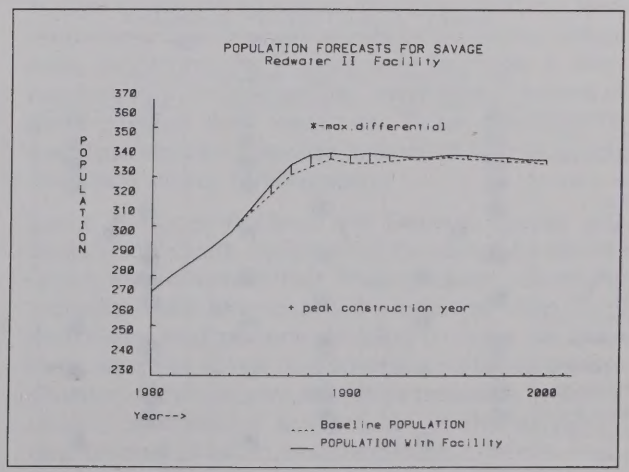










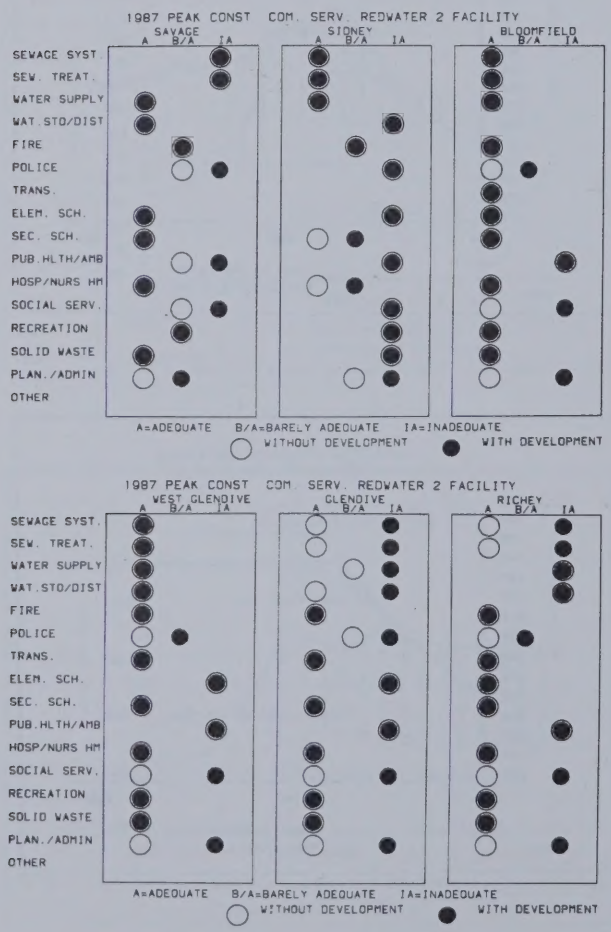


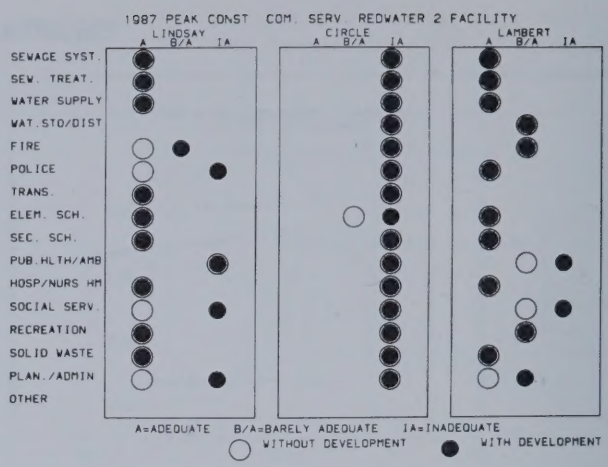
SOURCE: Respective city/county or regional planners.

Changes in regional personal income from facility development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee's payroll expenditure and through company expenditures for goods and services during the construction and operation phases. The Redwater II facility is forecasted to boost regional personal income by a maximum of 1.2 percent over baseline values by 1987 as a result of expenditures associated with the construction phase of this facility.

Peak employment during the construction phase is expected to occur in 1987 at 1248 employees with full operations employment expected in 1993 at 200 employees. Using 1987 as the first primary impact date, it is estimated that the above communities would experience an inadequate level of one or more community services as a direct result of the 1987 peak construction employment/population levels associated with construction of the facility (Figure 4). Glendive, for example, is forecasted to face a wide range of inadequate services as a result of population growth attributable to the construction of the facility. Additionally, Brockway

FIGURE 4



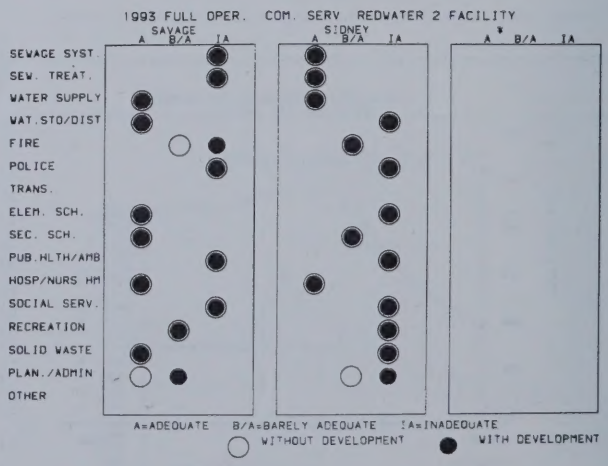


SOURCE: Respective city/county or regional planners.

and Fairview would experience an inadequate level of some community services by 1987 even without development. A facility-related population influx in this community would further exacerbate an inadequate service situation.

Full operation of the Redwater II facility (i.e., 1993 and beyond) is also expected to result in impacts on communities services. Figure 5 shows that Sidney,and Savage would experience inadequate services as a direct result of the population influx resulting from facility operation. Additionally, the following communities in the study area are forecasted to face inadequate public services by 1991 even without tract development: Bloomfield, Richey, Glendive, West Glendive, Lindsay, Brockway, Circle, Lambert, and Fairview. Development of the facility would further worsen an inadequate service situation in these communities. For comparison

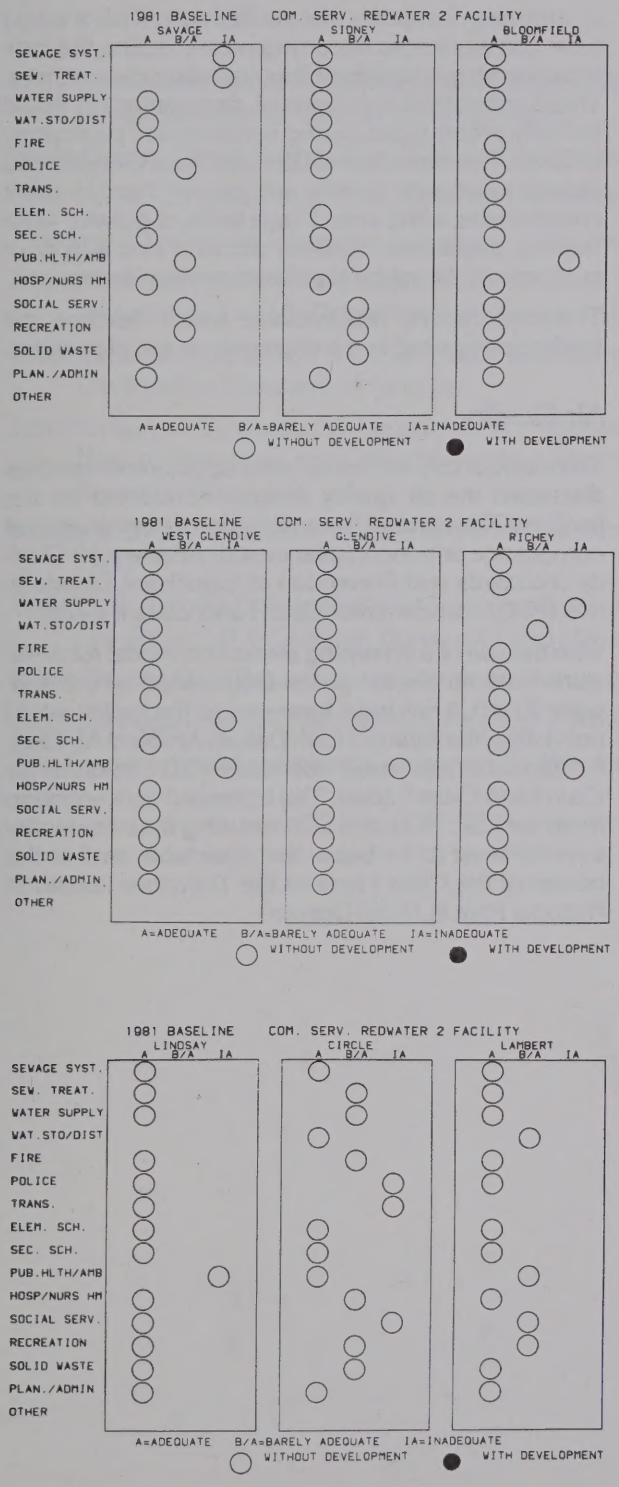
FIGURE 5



SOURCE: Respective city/county or regional planners.

purposes, Figure 6 shows current (1981) public service adequate assessments in impacted communities. communities.

FIGURE 6



SOURCE: Respective city/county or regional planners.

The adequacy ratings appearing in Figures 4, 5 and 6 reflect assessments by either city-county or regional planners for the communities involved and constitute the planners best judgments concerning the fiscal (revenue/cost) situation likely to be encountered by the communities in 1987 and 1993. Several of the services appearing in the community service graphics are of greater importance than others in maintaining public health and safety. Basic services such as sewage collection and treatment, water supply and water storage/distribution, health care and police/fire protection are of more immediate concern to community well-being than are nonbasic services such as recreation facilities and libraries. Consequently, communities which experience impacts to these basic services would undergo somewhat greater difficulties than would a community which experiences impacts on its nonbasic services. Additionally, inadequacy of basic services (water and sewage systems especially) can be difficult for a community to deal with because of the relatively large capital expenditures required for upgrading these types of services.

Support for the location of coal conversion facilities in McCone, Richland, and Dawson counties appears to be quite high. Eighty-seven residents were contacted by BLM and almost three-fourths of these respondents in the three county area expressed support for such facilities. While some of this support was qualified on the basis of controlling air quality degradation, it remains a high level of support. Roughly one-fourth of residents expressed opposition to such facilities and these persons tended to be more firm in their opposition than were proponents in their support. Across the three-county area, however, the strongest concern expressed by residents was that air quality standards be maintained.

Eighteen community leaders were contacted in Dawson, Richland, and McCone counties. Among these persons, opposition to the siting of a coal conversion facility was limited. Two McCone County community leaders expressed opposition and three McCone leaders were neutral or uncertain about the plants. Otherwise, all community leaders were favorable in their assessments of such facilities, even though several of them qualified their responses. These qualifications were typically based on maintenance of high air quality levels and similar considerations.

Some McCone, Richland and Dawson County residents would clearly benefit from the siting of a plant in or near the Redwater II tract. These persons, possessing industrial skills, able to acquire industrial skills, local merchants, and persons deciding to enter the labor force, would be able to take advantage of the local labor situation. Other present and future residents, however, unable or unwilling to compete in the enhanced employment situation, would experience the community changes brought on by development. Anxiety and stress would be evident as all residents of these com-

munities would have to deal with rapidly changing social situations.

The best thing about living in the three county area, according to many residents, is the relaxed, friendly, personable, and predictable social environment. The small-town way of life is widely endorsed by persons who live in these communities. Construction and operation of the Redwater facility would, due to rapid population growth particularly during the short term, reduce the general levels of satisfaction now evident in these communities. This reduction in satisfaction would likely be greatest in Circle (McCone County) but would also be characteristic of many residents in Glendive-West Glendive (Dawson County) and Sidney (Richland County). Large numbers of newcomers would certainly have an effect on the existing social environment, particularly during the short term, labor intensive construction phase.

Population growth caused by the construction of the Redwater II plant would fall primarily in Dawson County but also in McCone and Richland counties. The levels of growth in Dawson and Richland counties (cities of Glendive-West Glendive and Sidney) are not of sufficient scale to seriously jeopardize the respective communities' capacity to absorb change. Both areas have had some experience with industrialization, are moderately sized in population, and are relatively diverse economically and socially.

McCone County, however, is agricultural, homogenous, and has a small population base. For these reasons, the effects of construction of the Redwater II facility would be most pronounced in Circle and the rest of McCone County. These changes would be most evident during the short term but would, to some extent, persist through the operations phase as well. In the short term, it is expected that conditions in Circle would be fairly chaotic as residents and local administrators attempt to deal with rapid population growth. Many of the changes would be most evident only during the short term and would not persist as the operation phase proceeds.

In summary, it appears that the Redwater II plant would have consequences occurring mostly during the construction phase, tapering off as operation commences. These instabilities and signs of disorganization would be fairly pronounced during construction, particularly in Circle. The capacities of Glendive-West Glendive and Sidney to absorb growth are greater than in other communities in the area. These levels of growth, while causing disparaties between demand and supply of services, would not be significant or long lasting.

Technical reports are available which describe the methodology used in the economic or social analyses.

Air Quality

The introductory section on assumptions and variables discussed the air quality analysis conducted for the facilities. The result of the analysis is a determination of compliance or noncompliance with Ambient Air Quality Standards and Prevention of Significant Deterioration (PSD) Standards for Class I and Class II areas.

With the use of a screening dispersion model for emissions from an electric power facility sited on the Redwater II tract, it has been forecast that the facility would not violate Montana or North Dakota Ambient Air Quality Standards and would not violate PSD Standards for Class I and Class II areas. The increased concentration levels for TSP, NOx, and SO_2 resulting from the facility were forecast to be below the detectable level at the border of the Class I area of the Theodore Roosevelt National Park in North Dakota.

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